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(71)Applicant : **TOSHIBA CORP**

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(72)Inventor : **ICHINOSE NOBUHIKO**

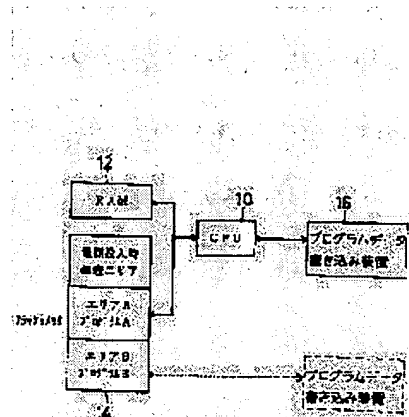
## (54) CONTROLLER FOR AUTOMATIC VENDING MACHINE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To attain a backup function even when the rewriting of a control program fails, to reduce the cost of a control program rewriting device, to make rewritable a control program even from a remote place, and to improve the security in the controller of an automatic vending machine using a flash memory.

**SOLUTION:** A new control program on a market is written in an area B of a flash memory part 14 by a program data writing device 16.

When it is judged that the control program is completely written in the area B at the time of power supply, a CPU 10 executes the control program from the leading address of the area B. When the control program in the area B is incomplete, a control program in an area A is executed so that the system-down of an automatic vending machine can not be generated.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The control unit of a vending machine characterized by providing the following The flash memory in which the control program which controls a vending machine was written RAM which memorizes data etc. Program data write-in equipment for writing a new vending machine control program in the aforementioned flash memory In the control unit of the vending machine which consists of central arithmetic units which control the whole The aforementioned flash memory a program required for control of a vending machine A device unit, Or the area divided per elimination sector of one device is equipped with a storage area memorizable [ two or more ]. Control program A is written in one area A of the aforementioned storage area at the time of factory shipments. The aforementioned program data write-in equipment writes new control program B in area B other than the aforementioned area A. It has a write-in detection means to detect whether control program B is completely written in the processing program of a power up in Area B. A means to pass the right of execution of a central arithmetic unit to the control program B when new control program B exists by the sound condition by the detection result by the aforementioned write-in detection means, and to pass the right of execution of a central arithmetic unit to control program A of the old software when it is judged that it is imperfect

[Claim 2] The version number for which the control program written in understands old and new [ of the control program written in ] is added. The area currently performed at the time of the writing of a new control program is removed. Writing is performed about area with the software of empty area or the oldest version. The processing program of a power up is equipped with a version acquisition means to acquire the program version of each storage area. The control unit of the vending machine according to claim 1 characterized by equipping the control program of the area which has the newest version number among the version numbers obtained from the aforementioned version acquisition means with a means to pass the right of execution of a central arithmetic unit.

[Claim 3] It is the control unit of the vending machine according to claim 1 which the data write-in equipment of a control program is built by the serial interface, and is carried out as the feature in the thing for which the aforementioned control program is inputted from the aforementioned serial interface, and which write in the writer program for new control program writing on Above RAM, passes and writes the right of execution of a central arithmetic unit in a writer program after the aforementioned writer program reception, and leaves control to a writer program.

[Claim 4] The data write-in equipment of a control program consists of serial interfaces. The aforementioned serial interface is common-use-ized with the serial interface which performs selling information data communication by infrared light communication with a handy terminal. Cable connection is made in the circuit of the infrared light communication modulator-and-demodulator preceding paragraph of the same serial interface as the aforementioned infrared light communication, and the communication at the time of the writing of program data communicates. The control unit of the vending machine according to claim 1 characterized by having a means to communicate in communication with program data transfer equipment with a high-speed transmission speed which

cannot be recovered from the middle of communication by infrared light communication.

[Claim 5] The aforementioned infrared light communication modulator and demodulator and program data transfer equipment are a control unit of the vending machine according to claim 4 characterized by consisting of OR circuits.

[Claim 6] The control unit of a vending machine according to claim 1 characterized by providing the following The communication device which communicates with the pin center, large computer of a remote place by the communication line The pin center, large telephone number setting device which was formed in the interior of a vending machine and which sets up the telephone number of a pin center, large computer beforehand The originating number identifier which detects a partner's telephone number at the time of the vending machine call in by the call origination from a pin center, large computer A means to permit writing in the control program which will be sent from a pin center, large computer if the telephone number memorized by the message serial number and the aforementioned pin center, large telephone number setting device which were obtained from the aforementioned originating number identifier at the time of the call in from a pin center, large computer is compared and the number is in agreement

[Claim 7] a price setup of goods, and a power-saving timer and cooling -- warming -- the control unit of the vending machine according to claim 6 characterized by making it rewrite the control point setting of vending machines, such as a change

[Claim 8] The control unit of the vending machine according to claim 1 which receives a control program change dispatch demand command at the time of the call in of the communication device which communicates with the pin center, large computer of a remote place by the communication line, the pin center, large telephone number setting device which was formed in the interior of a vending machine, and which sets up the telephone number of a pin center, large computer beforehand, and the vending machine by the call origination from a pin center, large computer, carries out call origination from a vending machine to a pin-center, large computer after a communication end, and is characterized by to have a means download a new control program from

[Claim 9] It is the control unit of the vending machine according to claim 1 characterized by having a memory management unit between a central arithmetic unit and memory, and mapping two or more area in the same logical address by the aforementioned memory management unit.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the control unit of the vending machine in consideration of the backup function at the time of rewriting failure, a low cost, expandability, and high security in the field of the invention which rewrites a control program in more detail about the control unit of the vending machine which carried the flash memory.

[0002]

[Description of the Prior Art] Conventionally, the vending machine which carried the flash memory was rewriting the only main part of a vending machine control program itself from memory card etc. for the control program of a vending machine itself. Moreover, rewriting of the control program to the vending machine from a remote place was not realized.

[0003]

[Problem(s) to be Solved by the Invention] However, in rewriting of the control program of the above-mentioned vending machine, it has the problem as shown below.

[0004] \*\* When rewriting is not normally completed in the power off or a certain trouble under rewriting of a control program, there is a problem that the function of the vending machine itself will stop. Moreover, control software does not disappear or the display of failure of rewriting of a control program cannot be performed.

[0005] \*\* In case a control program is rewritten, in using memory card, it is necessary to provide a memory card socket etc. in rewriting, and cost starts.

[0006] \*\* Rewriting of the control program from a remote place cannot be performed, but an operator needs to carry a leg to the place in which the vending machine is installed for rewriting again, and it takes time and effort.

[0007] Then, in view of the above-mentioned trouble, this invention aims at a backup function, even when rewriting of a control program goes wrong in the control unit of the vending machine using the flash memory, and it attains low-cost-ization of the rewriting equipment of a control program, further, enables rewriting of a control program even from a remote place, and, moreover, offers the control unit of the vending machine which aimed at improvement in security.

[0008]

[Means for Solving the Problem] The control unit of the vending machine of the claim 1 of this invention The flash memory in which the control program which controls a vending machine was written, RAM which memorizes data etc., and the program data write-in equipment for writing a new vending machine control program in the aforementioned flash memory, In the control unit of the vending machine which consists of central arithmetic units which control the whole The aforementioned flash memory a program required for control of a vending machine A device unit, Or the area divided per elimination sector of one device is equipped with a storage area memorizable [ two or more ]. Control program A is written in one area A of the aforementioned storage area at the time of factory shipments.

The aforementioned program data write-in equipment writes new control program B in area B other than the aforementioned area A. It has a write-in detection means to detect whether control program B is completely written in the processing program of a power up in Area B. When new control program B exists by the sound condition by the detection result by the aforementioned write-in detection means, the right of execution of a central arithmetic unit is passed to the control program B. When it is judged that it is imperfect, it is characterized by having a means to pass the right of execution of a central arithmetic unit to control program A of the old software.

[0009] In the thing of a claim 1, the control unit of the vending machine of a claim 2 to the control program written in The version number which old and new [ of the control program written in ] understands is added. The area currently performed at the time of the writing of a new control program is removed. Writing is performed about area with the software of empty area or the oldest version. The processing program of a power up is equipped with a version acquisition means to acquire the program version of each storage area. It is characterized by equipping the control program of the area which has the newest version number among the version numbers obtained from the aforementioned version acquisition means with a means to pass the right of execution of a central arithmetic unit.

[0010] In the thing of a claim 1, the data write-in equipment of a control program is built for the control unit of the vending machine of a claim 3 by the serial interface, and the thing for which the aforementioned control program is inputted from the aforementioned serial interface and which write in the writer program for new control program writing on Above RAM, passes and writes the right of execution of a central arithmetic unit in a writer program after the aforementioned writer program reception, and leaves control to a writer program is carrying out as the feature.

[0011] In the thing of a claim 1, the data write-in equipment of a control program consists of serial interfaces for the control unit of the vending machine of a claim 4. The aforementioned serial interface is common-use-ized with the serial interface which performs selling information data communication by infrared light communication with a handy terminal. Cable connection is made in the circuit of the infrared light communication modulator-and-demodulator preceding paragraph of the same serial interface as the aforementioned infrared light communication, and the communication at the time of the writing of program data communicates. In communication with program data transfer equipment, it is characterized by having a means to communicate with a high-speed transmission speed which cannot be recovered from the middle of communication by infrared light communication.

[0012] The control unit of the vending machine of a claim 5 is characterized by the aforementioned infrared light communication modulator and demodulator and program data transfer equipment consisting of OR circuits in the thing of a claim 4.

[0013] The communication device to which the control unit of the vending machine of a claim 6 communicates with the pin center,large computer of a remote place by the communication line in the thing of a claim 1, The pin center,large telephone number setting device which was formed in the interior of a vending machine and which sets up the telephone number of a pin center,large computer beforehand, The originating number identifier which detects a partner's telephone number at the time of the vending machine call in by the call origination from a pin center,large computer, The telephone number memorized by the message serial number and the aforementioned pin center,large telephone number setting device which were obtained from the aforementioned originating number identifier at the time of the call in from a pin center,large computer is compared. If the number is in agreement, it is characterized by having a means to permit writing in the control program sent from a pin center,large computer.

[0014] the control unit of the vending machine of a claim 7 -- the thing of a claim 6 -- setting -- a price setup of goods, and a power-saving timer and cooling -- warming -- it is characterized by making it rewrite the control point setting of vending machines, such as a change

[0015] The communication device to which the control unit of the vending machine of a claim 8 communicates with the pin center,large computer of a remote place by the communication line in the thing of a claim 1, The pin center,large telephone number setting device which was formed in the

interior of a vending machine and which sets up the telephone number of a pin center, large computer beforehand, A control program change dispatch demand command is received at the time of the call in of the vending machine by the call origination from a pin center, large computer. Call origination is carried out from a vending machine to a pin center, large computer after a communication end, and it is characterized by having a means to download a new control program from a pin center, large computer.

[0016] In the thing of a claim 1, the control unit of the vending machine of a claim 9 is equipped with a memory management unit between a central arithmetic unit and memory, and is characterized by mapping two or more area in the same logical address by the aforementioned memory management unit.

[0017] Even if it considers as the system which can carry two or more control programs of the vending machine memorized by the flash memory per a device or elimination sector and rewriting of a control program goes wrong, the old program is operated at the time of the abnormalities in rewriting, and it can avoid stopping the system of a vending machine in the control unit of the vending machine of a claim 1—

by means for the new control program to be completely written in or to detect to a power up.

[0018] When [ one ] a version is added to rewriting software as it is the control unit of the vending machine of a claim 2, and rewriting of a control program goes wrong, even if it makes it return to the software of an old version and this fails in rewriting of a control program, the system of a vending machine is not made downed.

[0019] File reading and serial communication are it made to perform a rewriting control program to be the control unit of the vending machine of a claim 3, and the system which can respond to improvement in the speed and multi-functionalization of rewriting in the future can be offered by developing and performing a rewriting control program on RAM.

[0020] The same line as the input/output interface which outputs and inputs the selling information on a vending machine in infrared light is used for the input/output interface which carries out specification to it being the control unit of the vending machine of a claim 4 at rewriting of a control program, and further, by infrared light, by making it a high-speed transmission speed to which it cannot restore so that it cannot communicate, it can make impossible rewriting of the control program from infrared light, can maintain security, and can offer a low cost rewriting system.

[0021] The system which does not need bond \*\*\*\* of a communication wire in the case of rewriting of the control program of a vending machine by it being the control unit of the vending machine of a claim 5 can be offered.

[0022] In case it can be it to be the control unit of the vending machine of a claim 6 made to perform rewriting of the control program of a vending machine from a remote place and a control program is rewritten in a telecommunication, comparison with the telephone number and the pin center, large dispatch telephone number which were registered into the vending machine can be performed, and the high remote rewriting system of security can be offered by permitting writing, only when in agreement.

[0023] it is the control unit of the vending machine of a claim 7 -- a price setup of goods not only rewriting of a control program but other than a control program, and a power-saving timer and cooling -- warming -- control point setting of vending machines, such as a change, can be made easy

[0024] The circuit which cannot detect the dispatch telephone number as it is the control unit of the vending machine of a claim 8 can be provided with the high remote rewriting system of security using a means to carry out call origination to the telephone number registered into the vending machine, to rewrite from a vending machine to it, and to require program data.

[0025] The system which can be written in arbitrary area with the only program code by mapping the area where the control program is written in by the memory management unit (MMU) on the unification logical address as it is the control unit of the vending machine of a claim 9 can be offered.

[0026]

[Embodiments of the Invention] (The 1st example) The 1st example of this invention is hereafter explained based on drawing 1 - drawing 5 .

[0027] Even if this example considers as the system which can carry two or more control programs of the vending machine memorized by the flash memory per a device or elimination sector and rewriting of

a control program goes wrong, a rewriting unusual error is displayed at the time of the abnormalities in rewriting, it operates the old program, and it is made not to stop the system of a vending machine by means for the new control program to be completely written in or to detect to a power up.

[0028] Drawing 1 is the block diagram showing the hard composition of this invention, and consists of program data write-in equipment 16 grades which write a control program in the central arithmetic unit (henceforth CPU) 10 which manages the whole control, RAM12 which memorizes data etc., the flash memory section 14 which stores a control program, and the flash memory section 14. In addition, the program data write-in equipment shown by the drawing middle point line shows the case where it constitutes from hardware.

[0029] As shown in drawing 1, it is divided into the 3-block program storing block at the flash memory section 14, and is divided into power-up processing area, the area A where Program A is stored, and the area B where Program B is stored.

[0030] Power-up processing area initializes hardware of a power up according to the flow of drawing 5 mentioned later. Search "55" of a last address from the form shown in drawing 4, and it searches whether a program exists in Area B. As compared with the checksum value which calculates the checksum of Area B as an "FF" and is added [checksum] at the end in 3 bytes of last if it exists, if in agreement, it will judge that the program is written in completely and the right of CPU execution will be passed to the head address of Area B.

[0031] The area A of the flash memory section 14 is a field where the control program of a vending machine is written in at the time of factory shipments, and is a field which does not disappear covering the whole life of a product. It performs, when the control program of the case where the control program is not written in Area B, or Area B is imperfection writing.

[0032] Moreover, the area B of the flash memory section 14 is a field which writes in a new control program with program data write-in equipment 16 in a commercial scene, and is a field which is not written in at all in the time of factory shipments. If a control program exists in this area B by the sound condition, the right of CPU execution will be passed to the head address of Area B by the program of the aforementioned power-up processing area.

[0033] Here, with the specification of a flash memory, as shown in drawing 2, the division method of the area of the flash memory section 14 may be made into the group unit of an elimination sector, or as shown in drawing 3, you may make it division of a device unit. In the case of drawing 3, Area A is stored in flash memory = of one device, and Area B is stored in flash memory = of one device. And it is made to store power-up processing area in the built-in ROM 18 of CPU10 as the so-called 1 chip microcomputer.

[0034] Drawing 4 shows the control program data written in the area B of the flash memory section (flash memory) 14, the checksum whether it is written in completely and for checking, and the example of write-in form of the program which added and wrote in the write-in end mark (for example, "55").

[0035] Next, the control action of the 1st example is explained with reference to drawing 5. If a power supply is first supplied to a vending machine, initialization of hardware will be performed by the program stored in power-up processing area (step S1 reference), "55" of a last address will be searched from the form which next progresses to Step S2 and is shown in drawing 4, and it will search whether a control program exists in Area B. When the control program new after shipment is written in Area B by program data write-in equipment 16 from works If a control program exists in Area B as "55" of a last address can be searched and it is shown in Step S3 The checksum of Area B is compared with the checksum value which calculates 3 bytes of last as an FF, and is added at the end in it (refer to step S4). If a value is in agreement, it will judge that the control program is completely written in Area B, and the right of CPU execution will be passed to the head address of Area B (step S5 reference).

[0036] Moreover, in Step S2, when it writes in Area B and an end mark "55" does not exist, in Area B, a new control program performs the control program at storing, now the time of the factory shipments which judge that it is absent, shift to Step S6, and are stored in Area A.

[0037] Also in step S4, in comparing the calculated value of the checksum of Area B with the checksum



value added to the last and not being in agreement, it judges that the new control program is not completely written in Area B, and performs the control program at the time of the factory shipments which shift to Step S6 and are stored in Area A.

[0038] Thus, since it is made for the control program of the area A stored at the time of factory shipments to operate in the 1st example when writing a new control program in the area B of a flash memory with program data write-in equipment 16 even if the write-in defect by power off or the noise occurs, it does not say that the system of a vending machine stops, therefore selling control of a vending machine can be performed, and it also becomes possible to write in a control program again.

[0039] In addition, once rewriting a control program in Area B, it is also possible to return to the control program at the time of factory shipments. For example, it is because "55" is overwriting the different value and, as for the control program of a vending machine, a system functions on the last address of Area B by the program (program at the time of factory shipments) of Area A intentionally.

[0040] (The 2nd example) The 2nd example adds a version to rewriting software, and when [ one ] rewriting of a control program goes wrong, it is made to return to the software of an old version.

[0041] The circuitry of this example is the same circuitry as a previous example, and is an example in the case of rewriting a control program by turns [ of Area A and Area B ]. In this example, the thing of a new version number is given priority to and performed among the control program currently written to the area A of a flash memory, and the control program currently written to Area B.

[0042] Drawing 6 shows the example of write-in form of the control program of Area A and Area B, and adds a version number to each area, for example, the version number of the control program of Area A is "01-12", and the version number of the control program of Area B is "01-03." In this case, since the version number of Area A is "01-12", and it is larger than the version number "01-03" of Area B (a program is new), it performs by the control program of Area A having priority.

[0043] Drawing 7 is a flow chart which shows the control action of the 2nd example, and explains operation based on this flow chart. If initialization of hardware is made like a previous example (step S11 reference), it writes in Area A at Step S12 and there is an end mark "55" after a power supply is switched on, it will progress to Step S13. At Step S13, it judges whether it writes in Area B and there is any end mark "55", and if there is a write-in end mark "55", it will shift to Step S14. Since the version number of Area A is new as the version number of Area A and Area B is judged at Step S14 and this example shows to drawing 6, it progresses to Step S19.

[0044] And it judges whether it writes in Area A at Step S19, and there is any end mark "55", and if there is a write-in end mark "55", it will shift to Step S20. The checksum which calculated the checksum like the case of drawing 5 at Step S20, and was calculated at Step S21 is compared with the checksum value added to the last, if in agreement, it will judge that the control program is written in completely and the control program of Area A will be performed.

[0045] Moreover, at Step S14, when the version number of Area B is new, it progresses to Step S15, processing is made similarly (Step S16 and step S17 reference), and the control program of Area B is performed (step S18 reference).

[0046] in addition, when it writes in each area and there is no end mark "55", or when a checksum value is not in agreement, it will shift to Step S23 or Step S24, and the control program (control program of the area which was operating at the time of writing) before writing in newly and being carried out will be performed. Thereby, the system down of a vending machine does not happen and a function does not stop.

[0047] In this example, there is only two area, A and B, where a control program exists, and since the area which was being moved at the time of rewriting is old software, it does not need to compare a checksum. In this example, although it was made for the software at the time of factory shipments to run by the case of the 1st example when the writing of a control program went wrong, there is a merit that write in and the control program of a front version old [ one ] runs by this example. Although un-arranging will arise in the 1st example by the case at the time of factory shipments where there is fault soft, it does not produce this un-arranging in this example.

[0048] (The 3rd example) In the 3rd example, file reading and serial communication are made to perform a rewriting control program, and the system which can respond to improvement in the speed and multi-functionalization of rewriting by developing and performing a rewriting control program on RAM in the future is offered.

[0049] Drawing 8 is the block diagram showing the hard composition in the case of performing file reading of the 3rd example, and drawing 9 is the block diagram showing the hard composition in the case of rewriting the control program by serial communication. The program data entry unit 20 is formed in a vending machine VM so that it may illustrate, and in drawing 8, the file memory media 22, such as a floppy disk and a PC card, can equip now the program data entry unit 20 free [ ejection ]. Moreover, in drawing 9, the serial communication wire of a portable computer 24 is connected to the write-in terminal of the program data entry unit 20 of a vending machine VM.

[0050] Drawing 10 is explanatory drawing of operation which expressed the content of communication in the case of rewriting a control program in a vending machine VM, and the flow of control program writing with time series, and explains operation of writing based on this drawing 10. In addition, the same of control action is said of the writing to the flash memory section 14 by the file memory medium 22, and the writing by the portable computer 24.

[0051] In = normal operation of drawing 10, the software (control program) of the right of CPU execution is in the area A of the flash memory section 14, and there is a free area in RAM12. Although it rewrites from the file memory medium 22 or a portable computer 24, and a program is downloaded and it rewrites in the target area in order to rewrite a control program, the rewriting software which read by the program data entry unit 20, and was further read in the preceding paragraph of this download is developed to the free area of RAM12. Next, rewriting software on incorporated RAM12 is performed, and a new control program is written in Area B in area and this example. Next, a system is once reset, the control program currently written in Area B is performed, and the usual selling control is performed. In this case, it is programmed to perform the control program newly written in one of area.

[0052] Thereby, the system which can respond to improvement in the speed and multi-functionalization of rewriting of a control-of-the-future program can be offered.

[0053] (The 4th example) The 4th example is explained below. In this example, further, by infrared light, the same line as the input/output interface which outputs and inputs the selling information on a vending machine in infrared light is used for the input/output interface which carries out specification to rewriting of a control program, and it is making it a high-speed transmission speed to which it cannot restore, makes impossible rewriting of the control program from infrared light, maintains security so that it cannot communicate, and it offers a low cost rewriting system.

[0054] Drawing 11 is the block diagram showing hard composition, and the input/output interface 26 connected with the infrared strange recovery unit 28 which delivers and receives the selling information data from a handy terminal 34 by communication by infrared radiation, and this infrared strange recovery unit 28 through the data communication line 30 is formed in this vending machine VM. Other composition is the same as that of the case of the vending machine VM in a previous example.

[0055] this example common-use-izes the data communication line 30 which transmits the data of the selling information on the vending machine VM using the infrared light line, and the rewriting data communication line of the flash memory section 14. As shown in drawing 11, when rewriting a control program, it is made to carry out by substituting the signal line 32 from the data communication line 30 and portable computer 24 from the infrared strange recovery unit 28. Optical (infrared light) communication is an ASK method which makes luminescence wavelength a main carrier and is further modulated considering the square wave of 10kHz of numbers as a subcarrier. Therefore, there is a limitation in the speed which can communicate optical communication, and a strange recovery cannot be performed in a not much quick transmission speed. Moreover, if it is common to be attached to the front face of a vending machine VM as for optical communication so that communication may be possible without opening the door of a vending machine VM, therefore a control program writes it and it changes by optical communication, it has a security top problem.

[0056] Then, when the first data link by the handy terminal 34 communicates by the same method as infrared light communication and rewrites a control program, transmission speed is gathered from the middle, it becomes unusual a communication impossibility [ it ], i.e., communicating, and it enables it to maintain the security from optical communication at optical communication in this example. Moreover, it is utility in gathering transmission speed at shortening of the rewriting time of a control program.

[0057] Drawing 12 is explanatory drawing of operation showing the control action of the above-mentioned communication, drawing 12 (a) shows the usual communication state by the infrared light in the case of setting up the selling information on a vending machine VM and a handy terminal 34, and drawing 12 (b) shows the case of communication of rewriting of the control program by the portable computer 24.

[0058] As shown in drawing 12 (a), in communication by the infrared light of a handy terminal 34 and a vending machine VM, thereby, a command is first transmitted from a handy terminal 34, the acknowledgement signal ACK is returned to a handy terminal 34, subsequently, transmission speed is 4800BPS from the beginning to the last, and it sends [ a vending machine VM sends a password etc. and ] data, such as a selling information setup, to a vending machine VM from a handy terminal 34 further.

[0059] Next, in rewriting the control program of a vending machine VM, a command is sent to a vending machine VM from a portable computer 24, and it returns the acknowledgement signal ACK to a portable computer 24 from a vending machine VM. The transmission speed so far is 4800BPS like the case of the point. And when sending a password to a vending machine VM from a portable computer 24, it has changed into the transmission speed of 76800BPS which cannot be recovered from from by optical communication. A portable computer 24 sends data (data of a control program) to a vending machine VM, and a control program is rewritten by one of the area A and B in a vending machine VM.

[0060] Security will be maintained by this. in addition, except for rewriting of a control program -- the selling price, a power-saving timer, and cooling -- warming -- it is applicable also to change of the setting data of the vending machine which needs security, such as a change

[0061] (The 5th example) this example is an example of improvement of the 4th previous example, is adopting an OR circuit between the infrared strange recovery unit 28 and an input/output interface 26, and offers the system which does not need bond \*\*\*\* of a communication wire in the case of rewriting of the control program of a vending machine VM.

[0062] That is, although the signal line 32 to the infrared strange recovery unit 28 needed to be connected and changed into the portable computer 24 in the 4th example, by adopting the OR circuit according this signal line to the open collector of a transistor, the exclusive terminal (connector) to a portable computer 24 can be equipped, it becomes rewritable [ a control program ] only by inserting the signal line from a portable computer 24 in the connector, and workability improves.

[0063] A block diagram is shown in drawing 13 . Considering the line and the data communication line 30 from a connector 36 only for rewritings as OR connection, a connector 36 and a portable computer 24 are composition connected by the signal line 38. Drawing 14 (a) shows the example of above-mentioned OR circuit 40, and shows the concrete circuit diagram of the gate G open collector type [ in drawing ] to drawing 14 (b). Here, when using signal-level level, such as RS-232C, so that it may illustrate, it is necessary to use the interface circuitry 44 equipped with the level converter 42.

[0064] Thus, in this example, when rewriting a control program, it can rewrite only by connecting the signal line 38 from a portable computer 24 to a connector 36, and the workability of rewriting improves.

[0065] (The 6th example) At this example, in case it can be made to perform rewriting of the control program of a vending machine from a remote place and a control program is rewritten in a telecommunication, comparison with the telephone number and the pin center, large dispatch telephone number which were registered into the vending machine is performed, and the high remote rewriting system of security is offered by permitting writing, only when in agreement.

[0066] The block diagram of this example is shown in drawing 15 . The pin center, large telephone number setting device 52 which it connects in the telephone-line 60 grade between the vending machine VM and the pin center, large computer 58, and registers the telephone number of the pin center, large

computer 58 beforehand with the communication device 46 which consists of an originating number identifier 50 which detects the telephone number sent to the vending machine VM through the telephone line 60, and a modem 48, and the SIO54 grade are prepared so that it may illustrate. Moreover, when making the telephone number of the pin center, large computer 58 memorize, it is made to utilize, and it is made for RAM12 to supply a power supply by the cell 56. Other composition is the same as that of a previous example.

[0067] this example is an example of rewriting of the control program which used the telephone line 60, and a close-up of the problem of security reservation of this is taken. An originating number identifier 50 is equipment with which NTT detects the message serial number represented by the number display which started service recently, and since it is already common knowledge, it omits explanation. The telephone number beforehand set up with the pin center, large telephone number setting device 52 by the vending machine VM side is compared with a partner's telephone number, and security is secured by specifying the partner who can do rewriting of a control program.

[0068] Drawing 16 is a flow chart which shows the control action of this example, when rewriting the control program of a vending machine VM through the telephone line 60 from the pin center, large computer 58, as shown in Step S31, carries out a line connection from the pin center, large computer 58 to a vending machine VM, and starts communication. Next, in Step S32, if the command demanded from the pin center, large computer 58 is not the writing of a control program, it will communicate according to the command which shifted to Step S35 and the pin center, large computer 58 is demanding. If it is the write request of a control program, it will progress to Step S33, the message serial number detected by the originating number identifier 50 is compared with the telephone number registered with the pin center, large telephone number setting device 52, and if not in agreement, it processes as unusual (step S36 reference). If the telephone number is in agreement, it will progress to Step S34 and a control program will be written in the area of the flash memory section 14 like a previous example. In addition, you may be made to process by comparing the telephone number which RAM12 was made to memorize the telephone number of the pin center, large computer 58, and was memorized with the telephone number detected by the originating number identifier 50.

[0069] In addition, if the door of a vending machine VM is not opened, it is preventing from setting up the pin center, large telephone number setting device 52 for security reservation. Moreover, it is applicable to change of the setting data of a vending machine VM as well as the 4th example.

[0070] Thus, in this example, when rewriting a control program through the telephone line 60, the high remote rewriting system of security can be built.

[0071] (The 7th example) In this example, the circuit which cannot detect the dispatch telephone number is provided with the high remote rewriting system of security in the 6th example using a means to carry out call origination to the telephone number registered into the vending machine, to rewrite from a vending machine to it, and to require program data.

[0072] The block diagram of this example is shown in drawing 17. In this case, since it is the case where a message serial number is not known, except that the originating number identifier 50 is not formed, it is the same composition as the case of drawing 15. Drawing 18 is a flow chart which shows the control action of this example, first, as shown in Step S41, carries out a line connection from the pin center, large computer 58 to a vending machine VM, and starts communication. Next, in Step S42, if the command demanded from the pin center, large computer 58 is not the writing of a control program, it will communicate according to the command which shifted to Step S47 and the pin center, large computer 58 is demanding. If it is the write request of a control program, as shown in Step S43, an acknowledgment will be performed to the pin center, large computer 58 from a vending machine VM, and a circuit will once be cut.

[0073] Then, call origination of the telephone number of the pin center, large computer 58 beforehand registered from the vending machine VM is carried out (step S44 reference), and if a circuit is not connected as shown in Step S45, it processes as unusual (step S48 reference). If a circuit is connected with the pin center, large computer 58, as shown in Step S46, a control program will be rewritten in the

flash memory section 14 like a previous example.

[0074] Thus, a purport to write a control program by the call origination of the pin center, large computer 58 first is told to a vending machine VM, by performing rewriting communication of a control program by the call origination to the telephone number of the pin center, large computer 58 beforehand set up from the subsequent vending machine VM, the rewriting partner of a control program can be specified and high security can be secured.

[0075] In addition, it is applicable to change of the setting data of a vending machine as well as the 6th example.

[0076] (The 8th example) this example offers the system which can be written in arbitrary area with the only program code by mapping the area where the control program is written in on the unification logical address by the memory management unit (MMU).

[0077] The composition of this example is shown in drawing 19. It has the composition of having added the memory management unit 62 to the composition of drawing 1 so that it may illustrate. Drawing 20 is explanatory drawing.

[0078] Since a physical address is different when it has two or more program areas and writes a control program in arbitrary area, the program code to write in changes with area and must prepare the program written in for every area. As shown in drawing 20 using a memory management unit 62 that this should be solved, the logical address of each area is made the same. In the example of illustration, the physical address of the program A stored in the area A of the flash memory section 14 is "4000" (head address), and the physical address of the program B stored in Area B is "C000" (head address). The logical address of Area A and Area B is set to the "4000" for this by the memory management unit 62. [ same ] Thereby, when writing a control program in every area, there is a merit which can use the same program code.

[0079]

[Effect of the Invention] Without control stopping by the above at the time of rewriting failure of a control program according to the control unit of the vending machine of this invention, it can operate with the old software, and it is not necessary to carry program download software in a product beforehand, the increase in efficiency of memory can be attained, and, moreover, download specification can be changed even afterwards. Furthermore, -izing of the write-in signal can be carried out [ \*\*\*\* ] with an infrared information signal transmission line, and low-cost-izing and high security-ization can be secured, and rewriting of the control program from a remote place can be performed using communication lines, such as the telephone line, and, moreover, high security-ization of control program rewriting can be attained.

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[Translation done.]

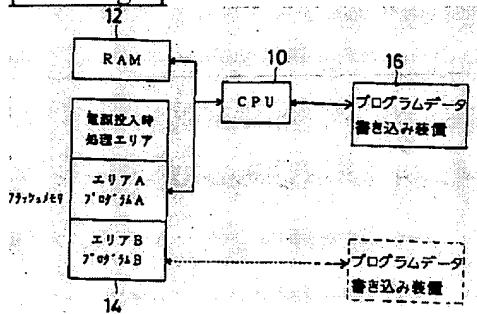
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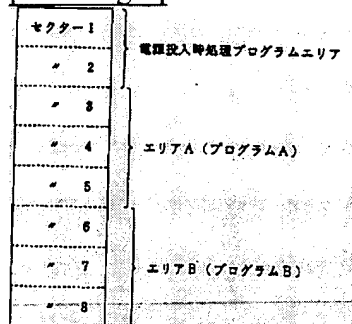
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

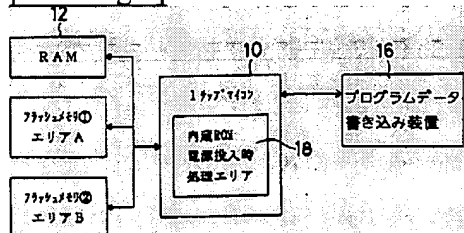
[Drawing 1]



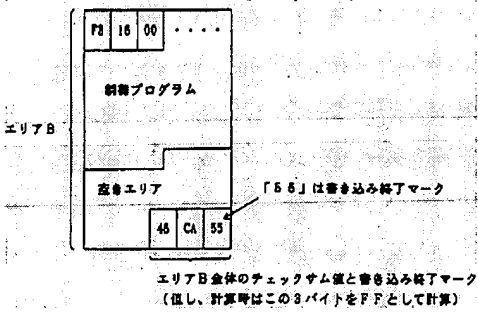
[Drawing 2]



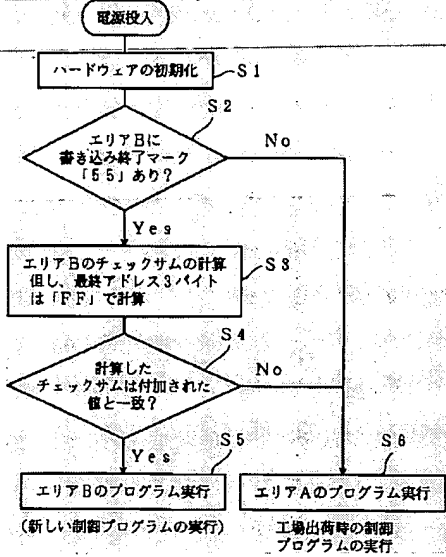
[Drawing 3]



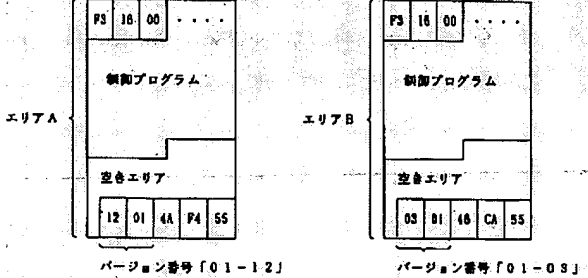
[Drawing 4]



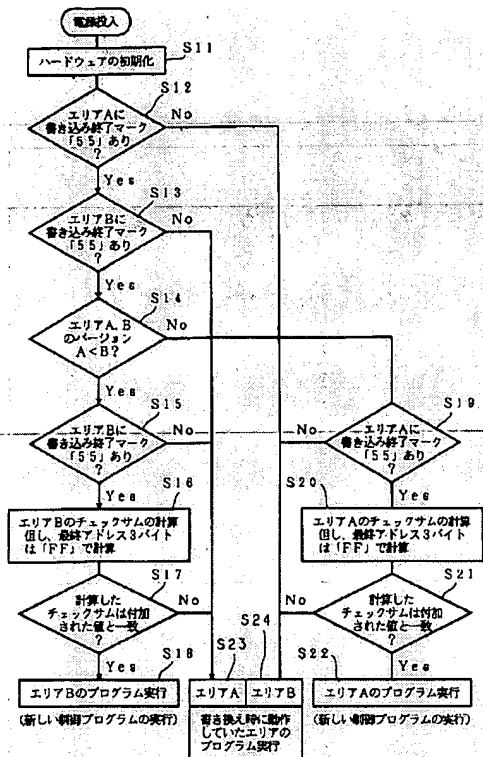
[Drawing 5]



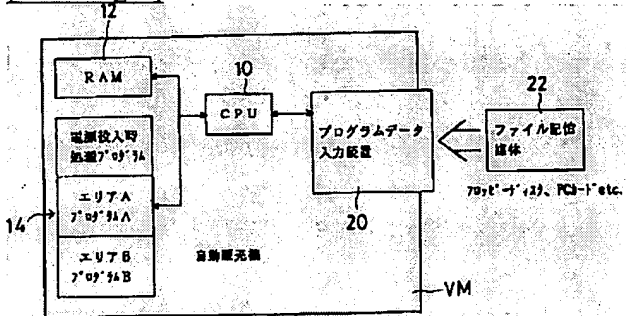
[Drawing 6]



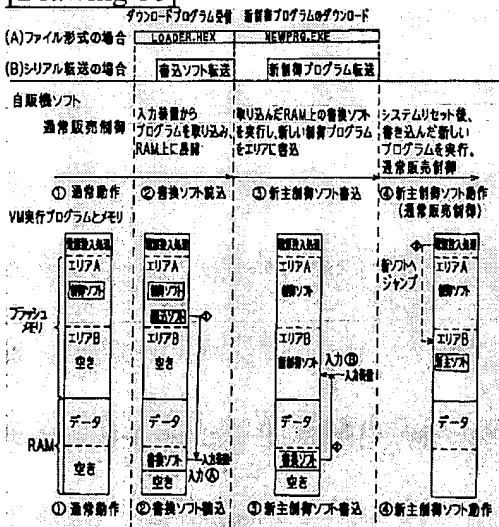
[Drawing 7]



[Drawing 8]

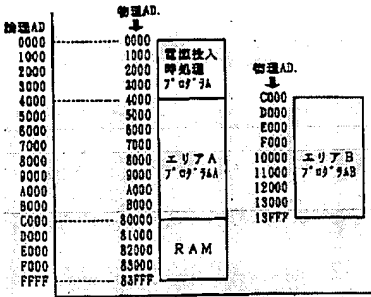


[Drawing 10]

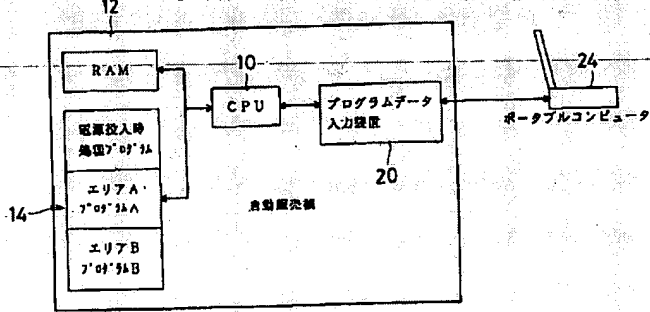


[Drawing 20]

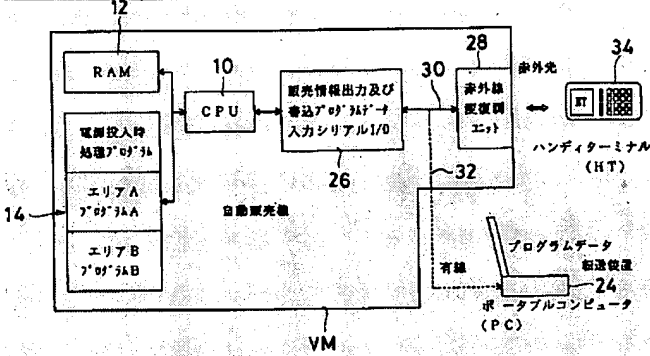




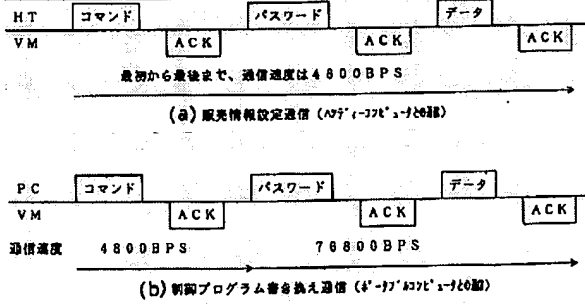
[Drawing 9]



[Drawing 11]



[Drawing 12]

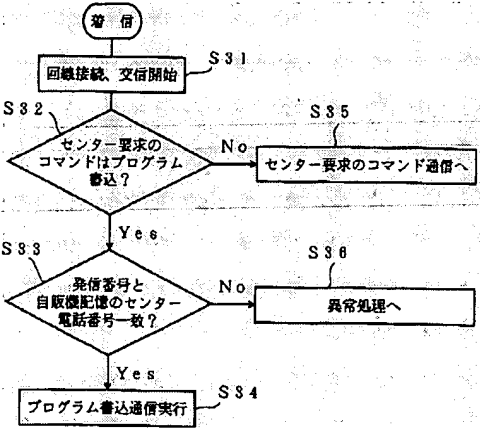


[Drawing 19]

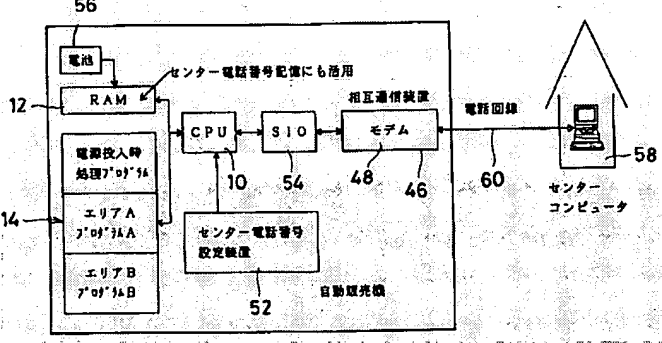
Figure 1 is a block diagram of a portable computer system. The system includes a CPU (10) connected to RAM (12) and a power supply unit (14). The CPU is also connected to a display unit (26) which contains a display (28) and a control unit (30). The display unit is connected to a hand terminal (34) via an optical link (32). The system is powered by a battery (36) which is connected to the CPU and the display unit. A portable computer (PC) (24) is connected to the system via a cable (38).

[illegible][illegible]

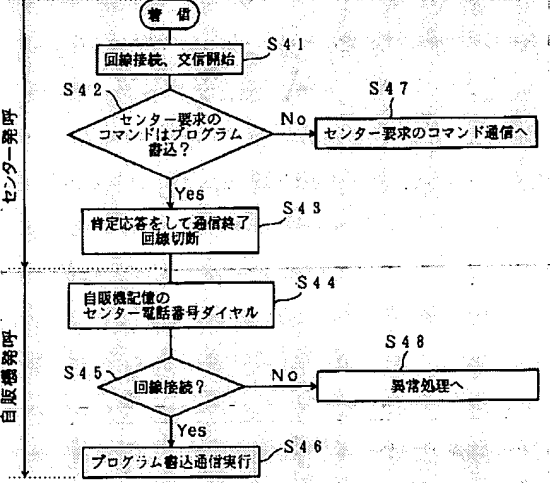
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[Drawing 17]



[Drawing 18]



[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the hard composition of the 1st example of this invention.

[Drawing 2] It is drawing showing the example which performed the program area division of the flash memory of the 1st example per sector.

[Drawing 3] It is a block diagram at the time of performing an area division per device of the flash memory of the 1st example.

[Drawing 4] It is drawing showing the example of write-in form of the program which wrote in the area B of the 1st example with the checksum, and added and wrote in the end mark.

[Drawing 5] It is the flow chart which shows the control action of the 1st example.

[Drawing 6] It is drawing showing the example of write-in form of the program at the time of adding the version number of the 2nd example.

[Drawing 7] It is the flow chart which shows the control action of the 2nd example.

[Drawing 8] It is the block diagram of the vending machine of the 3rd example.

[Drawing 9] It is the block diagram of the vending machine of other examples of the 3rd example.

[Drawing 10] It is drawing showing the content of communication of the 3rd example, and the flow of operation of a vending machine.

[Drawing 11] It is the block diagram of the vending machine of the 4th example.

[Drawing 12] It is explanatory drawing of operation at the time of changing the 4th communications protocol and transmission speed of an example.

[Drawing 13] It is the block diagram of the vending machine of the 5th example.

[Drawing 14] (a) is drawing showing the example of a circuit of OR connection of the 5th example. (b) is the example of a concrete circuit of the gate.

[Drawing 15] It is the block diagram of the vending machine of the 6th example.

[Drawing 16] It is the flow chart which shows the control action of the 6th example.

[Drawing 17] It is the block diagram of the vending machine of the 7th example.

[Drawing 18] It is the flow chart which shows the control action of the 7th example.

[Drawing 19] It is the block diagram of the vending machine of the 8th example.

[Drawing 20] It is explanatory drawing of the 8th example.

[Description of Notations]

10 CPU

12 RAM

14 Flash Memory Section

16 Program Data Write-in Equipment

20 Program Data Entry Unit

22 File Memory Medium

24 Portable Computer

26 Input/output Interface

28 Infrared Strange Recovery Unit  
30 Data Communication Line  
34 Handy Terminal  
40 OR Circuit  
50 Originating Number Identifier  
52 Pin Center,large Telephone Number Setting Device  
58 Pin Center,large Computer  
60 Telephone Line  
62 Memory Management Unit

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**EXAMPLE**

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(The 1st example) The 1st example of this invention is hereafter explained based on drawing 1 - drawing 5.

[0027] Even if this example considers as the system which can carry two or more control programs of the vending machine memorized by the flash memory per a device or elimination sector and rewriting of a control program goes wrong, a rewriting unusual error is displayed at the time of the abnormalities in rewriting, it operates the old program, and it is made not to stop the system of a vending machine by means for the new control program to be completely written in or to detect to a power up.

[0028] Drawing 1 is the block diagram showing the hard composition of this invention, and consists of program data write-in equipment 16 grades which write a control program in the central arithmetic unit (henceforth CPU) 10 which manages the whole control, RAM12 which memorizes data etc., the flash memory section 14 which stores a control program, and the flash memory section 14. In addition, the program data write-in equipment shown by the drawing middle point line shows the case where it constitutes from hardware.

[0029] As shown in drawing 1, it is divided into the 3-block program storing block at the flash memory section 14, and is divided into power-up processing area, the area A where Program A is stored, and the area B where Program B is stored.

[0030] Power-up processing area initializes hardware of a power up according to the flow of drawing 5 mentioned later. Search "55" of a last address from the form shown in drawing 4, and it searches whether a program exists in Area B. As compared with the checksum value which calculates the checksum of Area B as an "FF" and is added [ checksum ] at the end in 3 bytes of last if it exists, if in agreement, it will judge that the program is written in completely and the right of CPU execution will be passed to the head address of Area B.

[0031] The area A of the flash memory section 14 is a field where the control program of a vending machine is written in at the time of factory shipments, and is a field which does not disappear covering the whole life of a product. It performs, when the control program of the case where the control program is not written in Area B, or Area B is imperfection writing.

[0032] Moreover, the area B of the flash memory section 14 is a field which writes in a new control program with program data write-in equipment 16 in a commercial scene, and is a field which is not written in at all in the time of factory shipments. If a control program exists in this area B by the sound condition, the right of CPU execution will be passed to the head address of Area B by the program of the aforementioned power-up processing area.

[0033] Here, with the specification of a flash memory, as shown in drawing 2, the division method of the area of the flash memory section 14 may be made into the group unit of an elimination sector, or as shown in drawing 3, you may make it division of a device unit. In the case of drawing 3, Area A is stored in flash memory = of one device, and Area B is stored in flash memory = of one device. And it is made to store power-up processing area in the built-in ROM 18 of CPU10 as the so-called 1 chip microcomputer.

[0034] Drawing 4 shows the control program data written in the area B of the flash memory section (flash memory) 14, the checksum whether it is written in completely and for checking, and the example of write-in form of the program which added and wrote in the write-in end mark (for example, "55").

[0035] Next, the control action of the 1st example is explained with reference to drawing 5. If a power supply is first supplied to a vending machine, initialization of hardware will be performed by the program stored in power-up processing area (step S1 reference), "55" of a last address will be searched from the form which next progresses to Step S2 and is shown in drawing 4, and it will search whether a control program exists in Area B. When the control program new after shipment is written in Area B by program data write-in equipment 16 from works If a control program exists in Area B as "55" of a last address can be searched and it is shown in Step S3 The checksum of Area B is compared with the checksum value which calculates 3 bytes of last as an FF, and is added at the end in it (step S4 reference). If a value is in agreement, it will judge that the control program is completely written in Area B, and the right of CPU execution will be passed to the head address of Area B (step S5 reference).

[0036] Moreover, in Step S2, when it writes in Area B and an end mark "55" does not exist, in Area B, a new control program performs the control program at storing, now the time of the factory shipments which judge that it is absent, shift to Step S6, and are stored in Area A.

[0037] Also in step S4, in comparing the calculated value of the checksum of Area B with the checksum value added to the last and not being in agreement, it judges that the new control program is not completely written in Area B, and performs the control program at the time of the factory shipments which shift to Step S6 and are stored in Area A.

[0038] Thus, since it is made for the control program of the area A stored at the time of factory shipments to operate in the 1st example when writing a new control program in the area B of a flash memory with program data write-in equipment 16 even if the write-in defect by power off or the noise occurs, it does not say that the system of a vending machine stops, therefore selling control of a vending machine can be performed, and it also becomes possible to write in a control program again.

[0039] In addition, once rewriting a control program in Area B, it is also possible to return to the control program at the time of factory shipments. For example, it is because "55" is overwriting the different value and, as for the control program of a vending machine, a system functions on the last address of Area B by the program (program at the time of factory shipments) of Area A intentionally.

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**MEANS**

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[Means for Solving the Problem] The control unit of the vending machine of the claim 1 of this invention The flash memory in which the control program which controls a vending machine was written, RAM which memorizes data etc., and the program data write-in equipment for writing a new vending machine control program in the aforementioned flash memory, In the control unit of the vending machine which consists of central arithmetic units which control the whole The aforementioned flash memory a program required for control of a vending machine A device unit, Or the area divided per elimination sector of one device is equipped with a storage area memorizable [ two or more ]. Control program A is written in one area A of the aforementioned storage area at the time of factory shipments. The aforementioned program data write-in equipment writes new control program B in area B other than the aforementioned area A. It has a write-in detection means to detect whether control program B is completely written in the processing program of a power up in Area B. When new control program B exists by the sound condition by the detection result by the aforementioned write-in detection means, the right of execution of a central arithmetic unit is passed to the control program B. When it is judged that it is imperfect, it is characterized by having a means to pass the right of execution of a central arithmetic unit to control program A of the old software.

[0009] In the thing of a claim 1, the control unit of the vending machine of a claim 2 to the control program written in The version number which old and new [ of the control program written in ] understands is added. The area currently performed at the time of the writing of a new control program is removed. Writing is performed about area with the software of empty area or the oldest version. The processing program of a power up is equipped with a version acquisition means to acquire the program version of each storage area. It is characterized by equipping the control program of the area which has the newest version number among the version numbers obtained from the aforementioned version acquisition means with a means to pass the right of execution of a central arithmetic unit.

[0010] In the thing of a claim 1, the data write-in equipment of a control program is built for the control unit of the vending machine of a claim 3 by the serial interface, and the thing for which the aforementioned control program is inputted from the aforementioned serial interface and which write in the writer program for new control program writing on Above RAM, passes and writes the right of execution of a central arithmetic unit in a writer program after the aforementioned writer program reception, and leaves control to a writer program is carrying out as the feature.

[0011] In the thing of a claim 1, the data write-in equipment of a control program consists of serial interfaces for the control unit of the vending machine of a claim 4. The aforementioned serial interface is common-use-ized with the serial interface which performs selling information data communication by infrared light communication with a handy terminal. Cable connection is made in the circuit of the infrared light communication modulator-and-demodulator preceding paragraph of the same serial interface as the aforementioned infrared light communication, and the communication at the time of the writing of program data communicates. In communication with program data transfer equipment, it is characterized by having a means to communicate with a high-speed transmission speed which cannot be



recovered from the middle of communication by infrared light communication.

[0012] The control unit of the vending machine of a claim 5 is characterized by the aforementioned infrared light communication modulator and demodulator and program data transfer equipment consisting of OR circuits in the thing of a claim 4.

[0013] The communication device to which the control unit of the vending machine of a claim 6 communicates with the pin center, large computer of a remote place by the communication line in the thing of a claim 1, The pin center, large telephone number setting device which was formed in the interior of a vending machine and which sets up the telephone number of a pin center, large computer beforehand, The originating number identifier which detects a partner's telephone number at the time of the vending machine call in by the call origination from a pin center, large computer, The telephone number memorized by the message serial number and the aforementioned pin center, large telephone number setting device which were obtained from the aforementioned originating number identifier at the time of the call in from a pin center, large computer is compared. If the number is in agreement, it is characterized by having a means to permit writing in the control program sent from a pin center, large computer.

[0014] the control unit of the vending machine of a claim 7 -- the thing of a claim 6 -- setting -- a price setup of goods, and a power-saving timer and cooling -- warming -- it is characterized by making it rewrite the control point setting of vending machines, such as a change

[0015] The communication device to which the control unit of the vending machine of a claim 8 communicates with the pin center, large computer of a remote place by the communication line in the thing of a claim 1, The pin center, large telephone number setting device which was formed in the interior of a vending machine and which sets up the telephone number of a pin center, large computer beforehand, A control program change dispatch demand command is received at the time of the call in of the vending machine by the call origination from a pin center, large computer. Call origination is carried out from a vending machine to a pin center, large computer after a communication end, and it is characterized by having a means to download a new control program from a pin center, large computer.

[0016] In the thing of a claim 1, the control unit of the vending machine of a claim 9 is equipped with a memory management unit between a central arithmetic unit and memory, and is characterized by mapping two or more area in the same logical address by the aforementioned memory management unit.

[0017] Even if it considers as the system which can carry two or more control programs of the vending machine memorized by the flash memory per a device or elimination sector and rewriting of a control program goes wrong, the old program is operated at the time of the abnormalities in rewriting, and it can avoid stopping the system of a vending machine in the control unit of the vending machine of a claim 1 by means for the new control program to be completely written in or to detect to a power up.

[0018] When [ one ] a version is added to rewriting software as it is the control unit of the vending machine of a claim 2, and rewriting of a control program goes wrong, even if it makes it return to the software of an old version and this fails in rewriting of a control program, the system of a vending machine is not made downed.

[0019] File reading and serial communication are it made to perform a rewriting control program to be the control unit of the vending machine of a claim 3, and the system which can respond to improvement in the speed and multi-functionalization of rewriting in the future can be offered by developing and performing a rewriting control program on RAM.

[0020] The same line as the input/output interface which outputs and inputs the selling information on a vending machine in infrared light is used for the input/output interface which carries out specification to it being the control unit of the vending machine of a claim 4 at rewriting of a control program, and further, by infrared light, by making it a high-speed transmission speed to which it cannot restore so that it cannot communicate, it can make impossible rewriting of the control program from infrared light, can maintain security, and can offer a low cost rewriting system.

[0021] The system which does not need bond \*\*\*\* of a communication wire in the case of rewriting of the control program of a vending machine by it being the control unit of the vending machine of a claim

5 can be offered.

[0022] In case it can be it to be the control unit of the vending machine of a claim 6 made to perform rewriting of the control program of a vending machine from a remote place and a control program is rewritten in a telecommunication, comparison with the telephone number and the pin center, large dispatch telephone number which were registered into the vending machine can be performed, and the high remote rewriting system of security can be offered by permitting writing, only when in agreement.

[0023] it is the control unit of the vending machine of a claim 7 -- a price setup of goods not only rewriting of a control program but other than a control program, and a power-saving timer and cooling -- warming -- control point setting of vending machines, such as a change, can be made easy

[0024] The circuit which cannot detect the dispatch telephone number as it is the control unit of the vending machine of a claim 8 can be provided with the high remote rewriting system of security using a means to carry-out call-origination-to-the-telephone-number-registered-into-the-vending-machine, to rewrite from a vending machine to it, and to require program data.

[0025] The system which can be written in arbitrary area with the only program code by mapping the area where the control program is written in by the memory management unit (MMU) on the unification logical address as it is the control unit of the vending machine of a claim 9 can be offered.

[0026]

[Embodiments of the Invention]

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[Translation done.]

**\* NOTICES \***

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, in rewriting of the control program of the above-mentioned vending machine, it has the problem as shown below.

[0004] \*\* When rewriting is not normally completed in the power off or a certain trouble under rewriting of a control program, there is a problem that the function of the vending machine itself will stop. Moreover, control software does not disappear or the display of failure of rewriting of a control program cannot be performed.

[0005] \*\* In case a control program is rewritten, in using memory card, it is necessary to provide a memory card socket etc. in rewriting, and cost starts.

[0006] \*\* Rewriting of the control program from a remote place cannot be performed, but an operator needs to carry a leg to the place in which the vending machine is installed for rewriting again, and it takes time and effort.

[0007] Then, in view of the above-mentioned trouble, this invention aims at a backup function, even when rewriting of a control program goes wrong in the control unit of the vending machine using the flash memory, and it attains low-cost-ization of the rewriting equipment of a control program, further, enables rewriting of a control program even from a remote place, and, moreover, offers the control unit of the vending machine which aimed at improvement in security.

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[Translation done.]

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Without control stopping by the above at the time of rewriting failure of a control program according to the control unit of the vending machine of this invention, it can operate with the old software, and it is not necessary to carry program download software in a product beforehand, the increase in efficiency of memory can be attained, and, moreover, download specification can be changed even afterwards. Furthermore, -izing of the write-in signal can be carried out [ \*\*\*\* ] with an infrared information signal transmission line, and low-cost-izing and high security-ization can be secured, and rewriting of the control program from a remote place can be performed using communication lines, such as the telephone line, and, moreover, high security-ization of control program rewriting can be attained.

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[Translation done.]

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**PRIOR ART**

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[Description of the Prior Art] Conventionally, the vending machine which carried the flash memory was rewriting the only main part of a vending machine control program itself from memory card etc. for the control program of a vending machine itself. Moreover, rewriting of the control program to the vending machine from a remote place was not realized.

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[Translation done.]

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**TECHNICAL FIELD**

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[The technical field to which invention belongs] this invention relates to the control unit of the vending machine in consideration of the backup function at the time of rewriting failure, a low cost, expandability, and high security in the field of the invention which rewrites a control program in more detail about the control unit of the vending machine which carried the flash memory.

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(71) 出願人 000003078

株式会社東芝

神奈川県川崎市幸区堀川町72番地

(72) 発明者 一ノ瀬 信彦

大阪府茨木市太田東芝町1番6号 株式会

社東芝大阪工場内

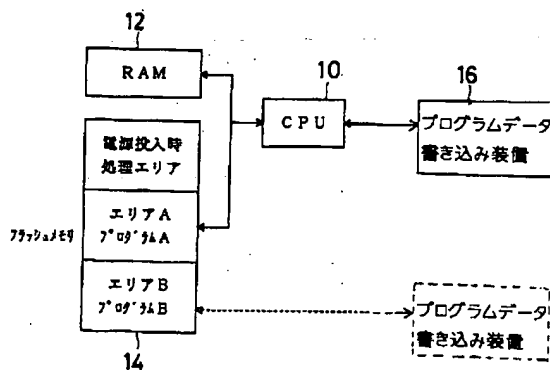
(74) 代理人 弁理士 葛田 瑋子 (外1名)

(54) 【発明の名称】 自動販売機の制御装置

(57) 【要約】

【課題】 フラッシュメモリを利用した自動販売機の制御装置において、制御プログラムの書き換えに失敗した場合でもバックアップ機能を図り、また制御プログラムの書き換え装置の低コスト化を図り、更には、遠隔地からでも制御プログラムの書き換えを可能とし、しかも、セキュリティの向上を図った自動販売機の制御装置を提供する。

【解決手段】 フラッシュメモリ部14のエリアBに市場で新しい制御プログラムをプログラムデータ書き込み装置16により書き込む。電源投入時にエリアBに制御プログラムが完全に書き込まれていると判断した場合にCPU10はエリアBの先頭番地から実行する。エリアBへの制御プログラムが不完全な場合には、エリアAの制御プログラムが実行され、自動販売機のシステムダウンは生じない。



## 【特許請求の範囲】

【請求項1】自動販売機をコントロールする制御プログラムが書き込まれたフラッシュメモリと、データ等を記憶するRAMと、新たな自動販売機制御プログラムを前記フラッシュメモリに書き込むためのプログラムデータ書き込み装置と、全体のコントロールを行なう中央演算装置とで構成される自動販売機の制御装置において、

前記フラッシュメモリは自動販売機の制御に必要なプログラムをデバイス単位、あるいは1デバイスの消去セクター単位で区切られるエリアに複数記憶できる記憶エリアを備え、

前記記憶エリアの1つのエリアAには工場出荷時に制御プログラムAが書き込まれ、

前記プログラムデータ書き込み装置は前記エリアA以外のエリアBに新しい制御プログラムBを書き込み、電源投入時の処理プログラムにエリアBに制御プログラムBが完全に書き込まれているかを検出する書き込み検出手段を備え、

前記書き込み検出手段による検出結果により新しい制御プログラムBが完全な状態で存在している場合にはその制御プログラムBへ中央演算装置の実行権を渡し、不完全と判断された場合には旧ソフトの制御プログラムAに中央演算装置の実行権を渡す手段を備えていることを特徴とする自動販売機の制御装置。

【請求項2】書き込まれる制御プログラムには、書き込まれる制御プログラムの新旧が判るバージョン番号が付加されており、

新しい制御プログラムの書き込み時に実行されているエリアを除き、書き込みは空きエリア又は最も古いバージョンのソフトがあるエリアについて行なわれ、電源投入時の処理プログラムは各記憶エリアのプログラムバージョンを取得するバージョン取得手段を備え、

前記バージョン取得手段から得られたバージョン番号のうち最新のバージョン番号を持つエリアの制御プログラムに中央演算装置の実行権を渡す手段を備えていることを特徴とする請求項1記載の自動販売機の制御装置。

【請求項3】制御プログラムのデータ書き込み装置はシリアルインターフェイスで構築され、

前記制御プログラムは前記シリアルインターフェイスから入力される新たな制御プログラム書き込みのためのライタープログラムを前記RAM上に書き込み、前記ライタープログラム受信後に中央演算装置の実行権をライタープログラムに渡して書き込み制御をライタープログラムに委ねることを特徴とする請求項1記載の自動販売機の制御装置。

【請求項4】制御プログラムのデータ書き込み装置はシリアルインターフェイスで構成され、

前記シリアルインターフェイスは販売情報データ通信をハンディターミナルと赤外光通信で行なうシリアルインターフェイスと共用化され、

プログラムデータの書き込み時の通信は前記赤外光通信と同一のシリアルインターフェイスの赤外光通信変復調器前段の回路に有線接続されて通信し、

プログラムデータ転送装置との通信では通信の途中から赤外光通信では復調不可能な高速の通信速度で通信する手段を備えていることを特徴とする請求項1記載の自動販売機の制御装置。

【請求項5】前記赤外光通信変復調器とプログラムデータ転送装置とはOR回路で構成されていることを特徴とする請求項4記載の自動販売機の制御装置。

【請求項6】通信回線で遠隔地のセンターコンピュータと通信をする通信装置と、

自動販売機の内部に設けられた予めセンターコンピュータの電話番号を設定しておくセンター電話番号設定装置と、

センターコンピュータからの発呼による自動販売機着呼時に相手の電話番号を検出する発信番号検出装置と、センターコンピュータからの着呼時に前記発信番号検出装置から得られた発信番号と前記センター電話番号設定装置に記憶されている電話番号を比較し、番号が一致していればセンターコンピュータから送られる制御プログラムを書き込むことを許可する手段を備えていることを特徴とする請求項1記載の自動販売機の制御装置。

【請求項7】商品の価格設定や節電タイマー、冷却加温切替等の自動販売機の制御設定を書き換えるようにしていることを特徴とする請求項6記載の自動販売機の制御装置。

【請求項8】通信回線で遠隔地のセンターコンピュータと通信をする通信装置と、

自動販売機の内部に設けられた予めセンターコンピュータの電話番号を設定しておくセンター電話番号設定装置と、

センターコンピュータからの発呼による自動販売機の着呼時に制御プログラム変更発信要求コマンドを受け、交信終了後に自動販売機からセンターコンピュータへ発呼し、新たな制御プログラムをセンターコンピュータからダウンロードする手段を備えていることを特徴とする請求項1記載の自動販売機の制御装置。

【請求項9】中央演算装置とメモリとの間にメモリマネジメントユニットを備え、

前記メモリマネジメントユニットにより複数のエリアは同一の論理アドレスにマッピングすることを特徴とする請求項1記載の自動販売機の制御装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、フラッシュメモリを搭載した自動販売機の制御装置に関するものであり、より詳しくは制御プログラムを書き換える利用分野において、書き換え失敗時のバックアップ機能、低コスト、拡張性、高セキュリティを考慮した自動販売機の制御装



置に関するものである。

【0002】

【従来の技術】従来、フラッシュメモリを搭載した自動販売機は、自動販売機の制御プログラムそのものをメモリカード等から唯一の自動販売機制御プログラム本体そのものを書き換えしていた。また、遠隔地からの自動販売機への制御プログラムの書き換えは実現されていなかった。

【0003】

【発明が解決しようとする課題】しかしながら、上記の自動販売機の制御プログラムの書き換えにおいては、以下に示すような問題を有している。

【0004】① 制御プログラムの書き換え中の電源断や何らかのトラブルで書き換えが正常に出来なかった場合に自動販売機自体の機能が停止してしまうという問題がある。また、制御ソフトが消えてしまったり、制御プログラムの書き換えの失敗の表示ができない。

【0005】② 制御プログラムを書き換えする際にメモリカードを使用する場合には、書き換え用にメモリカードソケット等を具備する必要がある、コストがかかる。

【0006】③ また、遠隔地からの制御プログラムの書き換えが出来ず、書き換えのために自動販売機が設置されている場所まで作業者が足を運ぶ必要があり、手間がかかる。

【0007】そこで本発明は上記問題点に鑑み、フラッシュメモリを利用した自動販売機の制御装置において、制御プログラムの書き換えに失敗した場合でもバックアップ機能を図り、また制御プログラムの書き換え装置の低コスト化を図り、更には、遠隔地からでも制御プログラムの書き換えを可能とし、しかも、セキュリティの向上を図った自動販売機の制御装置を提供するものである。

【0008】

【課題を解決するための手段】本発明の請求項1の自動販売機の制御装置は、自動販売機をコントロールする制御プログラムが書き込まれたフラッシュメモリと、データ等を記憶するRAMと、新たな自動販売機制御プログラムを前記フラッシュメモリに書き込むためのプログラムデータ書き込み装置と、全体のコントロールを行なう中央演算装置とで構成される自動販売機の制御装置において、前記フラッシュメモリは自動販売機の制御に必要なプログラムをデバイス単位、あるいは1デバイスの消去セクター単位で区切られるエリアに複数記憶できる記憶エリアを備え、前記記憶エリアの1つのエリアAには工場出荷時に制御プログラムAが書き込まれ、前記プログラムデータ書き込み装置は前記エリアA以外のエリアBに新しい制御プログラムBを書き込み、電源投入時の処理プログラムにエリアBに制御プログラムBが完全に書き込まれているかを検出する書き込み検出手段を備

え、前記書き込み検出手段による検出結果により新しい制御プログラムBが完全な状態で存在している場合にはその制御プログラムBへ中央演算装置の実行権を渡し、不完全と判断された場合には旧ソフトの制御プログラムAに中央演算装置の実行権を渡す手段を備えていることを特徴としている。

【0009】請求項2の自動販売機の制御装置は、請求項1のものにおいて、書き込まれる制御プログラムには、書き込まれる制御プログラムの新旧が判るバージョン番号が付加されており、新しい制御プログラムの書き込み時に実行されているエリアを除き、書き込みは空きエリア又は最も古いバージョンのソフトがあるエリアについて行なわれ、電源投入時の処理プログラムは各記憶エリアのプログラムバージョンを取得するバージョン取得手段を備え、前記バージョン取得手段から得られたバージョン番号のうち最新のバージョン番号を持つエリアの制御プログラムに中央演算装置の実行権を渡す手段を備えていることを特徴としている。

【0010】請求項3の自動販売機の制御装置は、請求項1のものにおいて、制御プログラムのデータ書き込み装置はシリアルインターフェイスで構築され、前記制御プログラムは前記シリアルインターフェイスから入力される新たな制御プログラム書き込みのためのライタープログラムを前記RAM上に書き込み、前記ライタープログラム受信後に中央演算装置の実行権をライタープログラムに渡して書き込み制御をライタープログラムに委ねることを特徴としている。

【0011】請求項4の自動販売機の制御装置は、請求項1のものにおいて、制御プログラムのデータ書き込み装置はシリアルインターフェイスで構成され、前記シリアルインターフェイスは販売情報データ通信をハンディターミナルと赤外光通信で行なうシリアルインターフェイスと共用化され、プログラムデータの書き込み時の通信は前記赤外光通信と同一のシリアルインターフェイスの赤外光通信変復調器前段の回路に有線接続されて通信し、プログラムデータ転送装置との通信では通信の途中から赤外光通信では復調不可能な高速の通信速度で通信する手段を備えていることを特徴としている。

【0012】請求項5の自動販売機の制御装置は、請求項4のものにおいて、前記赤外光通信変復調器とプログラムデータ転送装置とはOR回路で構成されていることを特徴としている。

【0013】請求項6の自動販売機の制御装置は、請求項1のものにおいて、通信回線で遠隔地のセンターコンピュータと通信をする通信装置と、自動販売機の内部に設けられた予めセンターコンピュータの電話番号を設定しておくセンター電話番号設定装置と、センターコンピュータからの発呼による自動販売機着呼時に相手の電話番号を検出する発信番号検出装置と、センターコンピュータからの着呼時に前記発信番号検出装置から得られた

発信番号と前記センター電話番号設定装置に記憶されている電話番号を比較し、番号が一致していればセンターコンピュータから送られる制御プログラムを書き込むことを許可する手段を備えていることを特徴としている。

【0014】請求項7の自動販売機の制御装置は、請求項6のものにおいて、商品の価格設定や節電タイマー、冷却加温切替等の自動販売機の制御設定を書き換えるようにしていることを特徴としている。

【0015】請求項8の自動販売機の制御装置は、請求項1のものにおいて、通信回線で遠隔地のセンターコンピュータと通信をする通信装置と、自動販売機の内部に設けられた予めセンターコンピュータの電話番号を設定しておくセンター電話番号設定装置と、センターコンピュータからの発呼による自動販売機の着呼時に制御プログラム変更発信要求コマンドを受け、交信終了後に自動販売機からセンターコンピュータへ発呼し、新たな制御プログラムをセンターコンピュータからダウンロードする手段を備えていることを特徴としている。

【0016】請求項9の自動販売機の制御装置は、請求項1のものにおいて、中央演算装置とメモリとの間にメモリマネジメントユニットを備え、前記メモリマネジメントユニットにより複数のエリアは同一の論理アドレスにマッピングすることを特徴としている。

【0017】請求項1の自動販売機の制御装置においては、フラッシュメモリに記憶される自動販売機の制御プログラムをデバイス又は消去セクター単位で複数搭載できるシステムとし、制御プログラムの書き換えに失敗しても新しい制御プログラムが完全に書き込まれているか電源投入時に検出する手段により、書き換え異常時は旧プログラムを動作させて、自動販売機のシステムを停止させないようにできる。

【0018】請求項2の自動販売機の制御装置であると、書き換えソフトにバージョンを付加し、制御プログラムの書き換えに失敗したときに一つ古いバージョンのソフトに戻るようにしたものであり、これにより制御プログラムの書き換えに失敗しても自動販売機のシステムをダウンさせることがない。

【0019】請求項3の自動販売機の制御装置であると、書き換え制御プログラムをファイル読み込みやシリアル通信により行なうようにしたものであり、書き換え制御プログラムをRAM上に展開、実行することで、将来書き換えの高速化や多機能化に対応できるシステムを提供できる。

【0020】請求項4の自動販売機の制御装置であると、制御プログラムの書き換えに仕様する入出力インターフェイスは、自動販売機の販売情報を赤外光にて入出力する入出力インターフェイスと同一ラインを使い、さらに赤外光では交信できないように復調不可能な高速の通信速度にすることで、赤外光からの制御プログラムの書き換えを不可能として、セキュリティを保ち、低コスト

とな書き換えシステムを提供することができる。

【0021】請求項5の自動販売機の制御装置であると、自動販売機の制御プログラムの書き換えの際に、通信線のつなぎ変えを必要としないシステムを提供することができる。

【0022】請求項6の自動販売機の制御装置であると、遠隔地から自動販売機の制御プログラムの書き換えができるようにし、遠隔通信にて制御プログラムを書き換える際に、自動販売機に登録された電話番号とセンター発信電話番号との比較を行ない、一致したときのみ書き込みを許可することで、セキュリティの高い遠隔書き換えシステムを提供することができる。

【0023】請求項7の自動販売機の制御装置であると、制御プログラムの書き換えだけでなく、制御プログラム以外の商品の価格設定や節電タイマー、冷却加温切替等の自動販売機の制御設定を容易にできる。

【0024】請求項8の自動販売機の制御装置であると、発信電話番号を検出できない回線には、自動販売機から自動販売機に登録された電話番号へ発呼して書き換えプログラムデータを要求する手段を用いて、セキュリティの高い遠隔書き換えシステムを提供することができる。

【0025】請求項9の自動販売機の制御装置であると、メモリマネジメントユニット(MMU)により、統一論理アドレス上に制御プログラムが書き込まれているエリアをマッピングすることで、唯一のプログラムコードで任意のエリアに書き込むことができるシステムを提供することができる。

【0026】

【発明の実施の形態】(第1の実施例)以下、本発明の第1の実施例について、図1～図5に基づいて説明する。

【0027】本実施例は、フラッシュメモリに記憶される自動販売機の制御プログラムをデバイス又は消去セクター単位で複数搭載できるシステムとし、制御プログラムの書き換えに失敗しても新しい制御プログラムが完全に書き込まれているか電源投入時に検出する手段により、書き換え異常時は書き換え異常エラーを表示し、旧プログラムを動作させて、自動販売機のシステムを停止させないようにしているものである。

【0028】図1は本発明のハード構成を示すブロック図であり、全体の制御を司る中央演算装置(以下、CPUという)10と、データ等を記憶しておくRAM12と、制御プログラムを格納するフラッシュメモリ部14と、フラッシュメモリ部14に制御プログラムを書き込むプログラムデータ書き込み装置16等から構成されている。なお、図中点線で示したプログラムデータ書き込み装置は、ハードウェアで構成した場合を示している。

【0029】図1に示すように、フラッシュメモリ部14には3ブロックのプログラム格納ブロックに分かれて

おり、電源投入時処理エリアと、プログラムAが格納されるエリアAと、プログラムBが格納されるエリアBとに分かれている。

【0030】電源投入時処理エリアは、後述する図5のフローに従い、電源投入時のハードウェアの初期化を行ない、図4に示すフォームから最終アドレスの「55」を検索し、エリアBにプログラムが存在するかを検索し、存在すればエリアBのチェックサムを最終3バイトを「FF」として計算し、最後に付加されているチェックサム値と比較し、一致すればプログラムは完全に書き込まれていると判断してエリアBの先頭番地にCPU実行権を渡すようになっている。

【0031】フラッシュメモリ部14のエリアAは、工場出荷時に自動販売機の制御プログラムが書き込まれる領域であり、製品の生涯にわたって消えることがない領域である。エリアBに制御プログラムが書き込まれていない場合やエリアBの制御プログラムが不完全書き込みの場合に実行されるものである。

【0032】またフラッシュメモリ部14のエリアBは、市場で新しい制御プログラムをプログラムデータ書き込み装置16により書き込む領域であり、工場出荷時では何も書き込まれていない領域である。このエリアBに制御プログラムが完全な状態で存在すると、前記電源投入時処理エリアのプログラムによりCPU実行権がエリアBの先頭番地に渡されるようになっている。

【0033】ここで、フラッシュメモリ部14のエリアの分割方法は、フラッシュメモリの仕様により、図2に示すように消去セクターのグループ単位とするか、図3に示すようにデバイス単位の分割にしても良い。図3の場合では、1つのデバイスのフラッシュメモリにエリアAを格納し、1つのデバイスのフラッシュメモリにエリアBを格納している。そして、電源投入時処理エリアは、いわゆる1チップマイコンとしてCPU10の内蔵ROM18内に格納するようになっている。

【0034】図4はフラッシュメモリ部（フラッシュメモリ）14のエリアBに書き込まれる制御プログラムデータと、完全に書き込まれているかチェックするためのチェックサムと、書き込み終了マーク（例えば、「55」）を付加して書き込んだプログラムの書き込みフォーム例を示している。

【0035】次に、第1の実施例の制御動作について図5を参照して説明する。まず自動販売機に電源が投入されると、電源投入時処理エリアに格納されているプログラムによりハードウェアの初期化が行なわれ（ステップS1参照）、次にステップS2に進んで図4に示すフォームから最終アドレスの「55」を検索し、エリアBに制御プログラムが存在するかを検索する。工場から出荷後に新しい制御プログラムがプログラムデータ書き込み装置16によりエリアBに書き込まれている場合には、最終アドレスの「55」を検索でき、ステップS3に示

すように、エリアBに制御プログラムが存在すれば、エリアBのチェックサムを最終3バイトをFFとして計算し、最後に付加されているチェックサム値と比較し（ステップS4参照）、値が一致すれば制御プログラムはエリアBに完全に書き込まれていると判断してエリアBの先頭番地にCPU実行権を渡す（ステップS5参照）。

【0036】また、ステップS2において、エリアBに書き込み終了マーク「55」が存在しない場合には、エリアBには新しい制御プログラムが格納されていないと判断して、ステップS6に移行し、エリアAに格納されている工場出荷時の制御プログラムを実行する。

【0037】ステップS4においても、エリアBのチェックサムの計算値と最後に付加されているチェックサム値とを比較して一致しない場合には、エリアBには新しい制御プログラムが完全に書き込まれていないと判断し、ステップS6に移行してエリアAに格納されている工場出荷時の制御プログラムを実行する。

【0038】このように第1の実施例においては、プログラムデータ書き込み装置16によりフラッシュメモリのエリアBに新しい制御プログラムを書き込む時に、電源断やノイズによる書き込み不良が発生しても、工場出荷時に格納されているエリアAの制御プログラムが動作するようにしているため、自動販売機のシステムが停止するということがなく、そのため、自動販売機の販売制御ができて、再度制御プログラムの書き込みをすることも可能となる。

【0039】なお、一旦エリアBに制御プログラムを書き換えた後に、工場出荷時の制御プログラムに戻すことも可能である。例えば、故意にエリアBの最終アドレスに「55」とは違った値を上書きすることで、自動販売機の制御プログラムはエリアAのプログラム（工場出荷時のプログラム）でシステムが機能するからである。

【0040】（第2の実施例）第2の実施例は、書き換えソフトにバージョンを付加し、制御プログラムの書き換えに失敗したときに一つ古いバージョンのソフトに戻るようにしたものである。

【0041】この実施例の回路構成は先の実施例と同様の回路構成であり、制御プログラムの書き換えをエリアAとエリアBの交互に行なう場合の例である。この実施例では、フラッシュメモリのエリアAに書かれている制御プログラムとエリアBに書かれている制御プログラムのうち新しいバージョン番号のものを優先して実行するものである。

【0042】図6はエリアAとエリアBの制御プログラムの書き込みフォーム例を示し、各エリアにバージョン番号を付加したものであり、例えば、エリアAの制御プログラムのバージョン番号は、「01-12」であり、エリアBの制御プログラムのバージョン番号は、「01-03」である。この場合、エリアAのバージョン番号が「01-12」なので、エリアBのバージョン番号

「01-03」より大きい(プログラムが新しい)ため、エリアAの制御プログラムが優先して実行されるようになっている。

【0043】図7は第2の実施例の制御動作を示すフローチャートであり、このフローチャートに基づいて動作を説明する。電源が投入された後、先の実施例と同様にハードウェアの初期化がなされ(ステップS11参照)、ステップS12でエリアAに書き込み終了マーク「55」があるとステップS13に進む。ステップS13ではエリアBに書き込み終了マーク「55」があるかどうかを判断し、書き込み終了マーク「55」があればステップS14に移行する。ステップS14でエリアAとエリアBのバージョン番号を判断し、この例では図6に示すようにエリアAのバージョン番号が新しいので、ステップS19に進む。

【0044】そして、ステップS19でエリアAに書き込み終了マーク「55」があるかどうかを判断し、書き込み終了マーク「55」があればステップS20に移行する。ステップS20では図5の場合と同様にチェックサムの計算を行ない、ステップS21で計算したチェックサムと、最後に付加されているチェックサム値とを比較して、一致していれば制御プログラムは完全に書き込まれていると判断してエリアAの制御プログラムが実行されることになる。

【0045】また、ステップS14でエリアBのバージョン番号が新しい場合には、ステップS15に進み、同様にして処理がなされ(ステップS16、ステップS17参照)、エリアBの制御プログラムが実行される(ステップS18参照)。

【0046】なお、各エリアに書き込み終了マーク「55」がない場合や、チェックサム値が一致しない場合には、ステップS23あるいはステップS24に移行して、新しく書き込みされる前の制御プログラム(書き込み時に動作していたエリアの制御プログラム)が実行されることになる。これにより、自動販売機のシステムダウンが起らず、機能が停止することはない。

【0047】この例では、制御プログラムが存在するエリアはA、Bの2つしかなく、書き換え時に動いていたエリアは古いソフトなのでチェックサムを比較する必要はない。本例では、制御プログラムの書き込みに失敗した場合、第1の実施例の場合では工場出荷時のソフトが動くようにしていたが、本実施例では書き込み前の1つ古いバージョンの制御プログラムが動くというメリットがある。工場出荷時におけるソフトに不具合があった場合などでは第1の実施例では不都合が生じることになるが、本実施例ではかかる不都合は生じない。

【0048】(第3の実施例)第3の実施例では、書き換え制御プログラムをファイル読み込みやシリアル通信により行なうようにしたものであり、書き換え制御プログラムをRAM上に展開、実行することで、将来書き換

えの高速化や多機能化に対応できるシステムを提供するようにしたものである。

【0049】図8は第3の実施例のファイル読み込みを行なう場合のハード構成を示すブロック図であり、図9は、シリアル通信による制御プログラムの書き換えを行なう場合のハード構成を示すブロック図である。図示するように自動販売機VMにはプログラムデータ入力装置20が設けられ、図8ではフロッピーディスク、PCカード等のファイル記憶媒体22がプログラムデータ入力装置20に取り出し自在に装着できるようになっている。

また、図9では自動販売機VMのプログラムデータ入力装置20の書き込み端子にポータブルコンピュータ24のシリアル通信線が接続されるようになっている。

【0050】図10は自動販売機VMに制御プログラムの書き換えを行なう場合の通信内容と制御プログラム書き込みのフローを時系列で表した動作説明図であり、この図10に基づいて書き込みの動作を説明する。なお、ファイル記憶媒体22によるフラッシュメモリ部14への書き込みも、ポータブルコンピュータ24による書き込みも制御動作は同じである。

【0051】図10の通常動作において、フラッシュメモリ部14のエリアAにCPU実行権のソフト(制御プログラム)があり、またRAM12には空き領域がある。制御プログラムを書き換えるためには、ファイル記憶媒体22あるいはポータブルコンピュータ24から書き換えプログラムをダウンロードして目的のエリアに書き換えるが、このダウンロードの前段で、プログラムデータ入力装置20で読み込み、さらに読み込んだ書換ソフトをRAM12の空き領域に展開する。次に、取り込んだRAM12上の書換ソフトを実行し、新しい制御プログラムをエリア、この例ではエリアBに書き込む。次に、システムを一旦リセットし、エリアBに書き込まれている制御プログラムを実行し、通常の販売制御が行なわれる。この場合、いずれかのエリアに新しく書き込んだ制御プログラムを実行するようにプログラムされている。

【0052】これにより、将来制御プログラムの書き換えの高速化や多機能化に対応できるシステムを提供することができるものである。

【0053】(第4の実施例)次に第4の実施例について説明する。この実施例では、制御プログラムの書き換えに仕様する入出力インターフェイスは、自動販売機の販売情報を赤外光にて入出力する入出力インターフェイスと同一ラインを使い、さらに赤外光では通信できないように復調不可能な高速の通信速度にすることで、赤外光からの制御プログラムの書き換えを不可能として、セキュリティを保ち、低コストな書き換えシステムを提供するものである。

【0054】図11はハード構成を示すブロック図であり、この自動販売機VMでは、赤外線による通信により

ハンディターミナル34からの販売情報データの授受を行なう赤外線変復調ユニット28と、この赤外線変復調ユニット28とデータ通信ライン30を介して接続されている入出力インターフェイス26とが設けられている。他の構成は先の実施例における自動販売機VMの場合と同様である。

【0055】本実施例は、赤外光線を使った自動販売機VMの販売情報のデータの伝送を行なうデータ通信ライン30と、フラッシュメモリ部14の書き換えデータ通信線を共用化したものである。図11に示すように、制御プログラムを書き換える場合に、赤外線変復調ユニット28からのデータ通信ライン30とポータブルコンピュータ24からの信号線32を差し替えて行なうようにしている。光(赤外光)通信は発光波長を主搬送波とし、さらに数十kHzの方形波を副搬送波として変調されるASK方式である。したがって、光通信の通信可能な速度には限界があり、あまり速い通信速度では変復調はできない。また、光通信は自動販売機VMの扉を開けないで通信できるように自動販売機VMの前面に付いているのが一般的で、そのため、光通信で制御プログラムが書き変わってしまった場合はセキュリティ上問題がある。

【0056】そこで、本実施例では、ハンディターミナル34による最初のデータリンクまでは赤外光通信と同じ方式で通信を行ない、制御プログラムを書き換える場合には途中から通信速度を上げて光通信では通信不可能、すなわち、通信異常となり光通信からのセキュリティを保てるようにしている。また、通信速度を上げることで制御プログラムの書き換え時間の短縮に役立つものである。

【0057】図12は上記通信の制御動作を示す動作説明図であり、図12(a)は自動販売機VMとハンディターミナル34との販売情報を設定する場合の赤外光による通常の通信状態を示し、図12(b)はポータブルコンピュータ24による制御プログラムの書き換えの通信の場合を示している。

【0058】図12(a)に示すように、ハンディターミナル34と自動販売機VMとの赤外光による通信では、最初から最後まで通信速度は4800BPSであり、初めにハンディターミナル34からコマンドが送信され、それにより自動販売機VMがハンディターミナル34へアクノリッジ信号ACKを返送し、次いで、パスワード等を送り、さらにハンディターミナル34から自動販売機VMへ販売情報設定等のデータを送る。

【0059】次に、自動販売機VMの制御プログラムを書き換える場合には、ポータブルコンピュータ24からコマンドを自動販売機VMへ送り、自動販売機VMからポータブルコンピュータ24へアクノリッジ信号ACKを返送する。ここまでの通信速度は先の場合と同様に4800BPSである。そして、ポータブルコンピュータ

24から自動販売機VMへパスワードを送る時から光通信では復調不可能な76800BPSの通信速度に変更している。ポータブルコンピュータ24がデータ(制御プログラムのデータ)を自動販売機VMへ送り、自動販売機VMではいずれかのエリアA、Bに制御プログラムが書き換えられる。

【0060】これによりセキュリティが保たれることになる。なお、制御プログラムの書き換え以外に販売価格や節電タイマー、冷却加温切替等のセキュリティを必要とする自動販売機の設定データの変更にも応用することができる。

【0061】(第5の実施例)本実施例は先の第4の実施例の改良例であり、赤外線変復調ユニット28と入出力インターフェイス26との間にOR回路を採用することで、自動販売機VMの制御プログラムの書き換えの際に、通信線のつなぎ変えを必要としないシステムを提供するものである。

【0062】すなわち、第4の実施例では赤外線変復調ユニット28への信号線32をポータブルコンピュータ24につなぎ変える必要があったが、この信号線をトランジスタのオープンコレクタによるOR回路を採用することで、ポータブルコンピュータ24への専用端子(コネクタ)を装備でき、そのコネクタにポータブルコンピュータ24からの信号線を差し込むだけで制御プログラムの書き換えが可能となり、作業性が向上するものである。

【0063】図13にブロック図を示す。書き換え専用のコネクタ36からのラインとデータ通信ライン30とをOR接続とし、コネクタ36とポータブルコンピュータ24とは信号線38で接続する構成である。図14(a)は上記OR回路40の例を示すものであり、図中のオープンコレクタ型のゲートGの具体回路図を図14(b)に示す。ここで、図示するように、RS-232C等の信号電圧レベルを使う場合にはレベル変換器42を備えたインターフェイス回路44を用いる必要がある。

【0064】このように本実施例では、制御プログラムを書き換える場合にポータブルコンピュータ24からの信号線38をコネクタ36に接続するだけで書き換えを行なうことができ、書き換えの作業性が向上する。

【0065】(第6の実施例)本実施例では、遠隔地から自動販売機の制御プログラムの書き換えができるようにし、遠隔通信にて制御プログラムを書き換える際に、自動販売機に登録された電話番号とセンター発信電話番号との比較を行ない、一致したときのみ書き込みを許可することで、セキュリティの高い遠隔書き換えシステムを提供するようにしたものである。

【0066】図15に本実施例のブロック図を示す。図示するように自動販売機VMとセンターコンピュータ58との間は電話回線60等で接続されており、自動販売

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機VMには、電話回線60を介して発信された電話番号を検出する発信番号検出装置50とモデム48からなる通信装置46と、予めセンターコンピュータ58の電話番号を登録しておくセンター電話番号設定装置52と、SIO54等が設けられている。また、RAM12はセンターコンピュータ58の電話番号を記憶させる場合に活用されており、電池56にて電源を供給するようにしている。他の構成は先の実施例と同様である。

【0067】本実施例は電話回線60を用いた制御プログラムの書き換え例で、これもセキュリティ確保の問題がクローズアップされる。発信番号検出装置50は、最近NTTがサービスを開始したナンバーディスプレイ等に代表される発信番号を検出する装置で、既に周知なので説明は省略する。自動販売機VM側でセンター電話番号設定装置52で予め設定されている電話番号と相手の電話番号とを比較し、制御プログラムの書き換えができる相手を特定することでセキュリティを確保するようにしたものである。

【0068】図16は本実施例の制御動作を示すフローチャートであり、センターコンピュータ58から電話回線60を介して自動販売機VMの制御プログラムを書き換える場合、ステップS31に示すようにセンターコンピュータ58から自動販売機VMへ回線接続をして交信を開始する。次にステップS32において、センターコンピュータ58から要求されたコマンドが制御プログラムの書き込みでなければ、ステップS35に移行してセンターコンピュータ58が要求しているコマンドに応じて通信される。制御プログラムの書き込み要求であればステップS33に進み、発信番号検出装置50で検出した発信番号とセンター電話番号設定装置52に登録している電話番号とを比較し、一致していなければ異常として処理を行なう（ステップS36参照）。電話番号が一致していれば、ステップS34に進んで先の実施例と同様に制御プログラムをフラッシュメモリ部14のエリアに書き込む。なお、センターコンピュータ58の電話番号をRAM12に記憶させておき、記憶された電話番号と発信番号検出装置50で検出した電話番号とを比較して処理を行なうようにしても良い。

【0069】なお、センター電話番号設定装置52はセキュリティ確保のため、自動販売機VMの扉を開けないと設定できないようにしている。また、第4の実施例と同様に自動販売機VMの設定データの変更にも応用することができる。

【0070】このように本実施例では、電話回線60を介して制御プログラムを書き換える場合に、セキュリティの高い遠隔書き換えシステムを構築することができるものである。

【0071】（第7の実施例）本実施例では、第6の実施例において、発信電話番号を検出できない回線には、自動販売機から自動販売機に登録された電話番号へ発呼

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して書き換えプログラムデータを要求する手段を用いて、セキュリティの高い遠隔書き換えシステムを提供するものである。

【0072】図17に本実施例のブロック図を示す。この場合は発信番号が分からない場合なので、発信番号検出装置50が設けられていない以外は図15の場合と同じ構成である。図18は本実施例の制御動作を示すフローチャートであり、まず、ステップS41に示すようにセンターコンピュータ58から自動販売機VMへ回線接続をして交信を開始する。次にステップS42において、センターコンピュータ58から要求されたコマンドが制御プログラムの書き込みでなければ、ステップS47に移行してセンターコンピュータ58が要求しているコマンドに応じて通信される。制御プログラムの書き込み要求であればステップS43に示すように、自動販売機VMからセンターコンピュータ58に肯定応答を行ない、一旦回線を切断する。

【0073】その後、自動販売機VMから予め登録しているセンターコンピュータ58の電話番号を発呼し（ステップS44参照）、ステップS45に示すように回線が接続されなければ異常として処理をする（ステップS48参照）。センターコンピュータ58と回線が接続されれば、ステップS46に示すように、先の実施例と同様にフラッシュメモリ部14に制御プログラムの書き換えを行なう。

【0074】このように、まずセンターコンピュータ58の発呼により制御プログラムを書き込みしたい旨を自動販売機VMに伝え、その後の自動販売機VMからの発呼により制御プログラムの書き換え交信を行なうことで、制御プログラムの書き換え相手の特定を行なって高いセキュリティを確保することができる。

【0075】なお、第6の実施例と同じく、自動販売機の設定データの変更にも応用できる。

【0076】（第8の実施例）本実施例は、メモリマネジメントユニット（MMU）により、統一論理アドレス上に制御プログラムが書き込まれているエリアをマッピングすることで、唯一のプログラムコードで任意のエリアに書き込むことができるシステムを提供するようにしたものである。

【0077】本実施例の構成を図19に示す。図示するように図1の構成にメモリマネジメントユニット62を追加した構成となっている。図20は説明図である。

【0078】複数のプログラムエリアを持ち、任意のエリアに制御プログラムを書き込む場合、物理アドレスが違ってくると、書き込むプログラムコードはエリアにより異なってしまう、各エリア毎に書き込むプログラムを用意しなければならない。これを解決すべくメモリマネジメントユニット62を用いて図20に示すように各エリアの論理アドレスを同一にする。図示例では、フラ

ッシュメモリ部14のエリアAに格納されているプログラムAの物理アドレスは「4000」（先頭番地）であり、エリアBに格納されているプログラムBの物理アドレスは「C000」（先頭番地）である。これをメモリマネジメントユニット62によりエリアAとエリアBとの論理アドレスを同一の「4000」にする。これにより、どのエリアに制御プログラムを書き込む場合でも、同一のプログラムコードを使えるメリットがある。

【0079】

【発明の効果】以上により本発明の自動販売機の制御装置によれば、制御プログラムの書き換え失敗時に制御が停止することなく、旧ソフトで動作が可能であり、また、プログラムダウンロードソフトを予め製品に搭載する必要がなく、メモリの効率化を図ることができ、しかも、ダウンロード仕様は後からでも変更が可能である。さらには、書き込み信号を赤外線情報通信信号線と共用化でき、低コスト化、高セキュリティ化を確保でき、また、電話回線等の通信回線を用いて遠隔地からの制御プログラムの書き換えができ、しかも、制御プログラム書き換えの高セキュリティ化を図ることができる。

【図面の簡単な説明】

【図1】本発明の第1の実施例のハード構成を示すブロック図である。

【図2】第1の実施例のフラッシュメモリのプログラムエリア分けをセクター単位で行なった例を示す図である。

【図3】第1の実施例のフラッシュメモリのデバイス単位でエリア分けを行なった場合のブロック図である。

【図4】第1の実施例のエリアBにチェックサムと書き込み終了マークを付加して書き込んだプログラムの書き込みフォーム例を示す図である。

【図5】第1の実施例の制御動作を示すフローチャートである。

【図6】第2の実施例のバージョン番号を付加した場合のプログラムの書き込みフォーム例を示す図である。

【図7】第2の実施例の制御動作を示すフローチャートである。

【図8】第3の実施例の自動販売機のブロック図である。

【図9】第3の実施例の他の例の自動販売機のブロック

図である。

【図10】第3の実施例の通信内容と自動販売機の動作の流れを示す図である。

【図11】第4の実施例の自動販売機のブロック図である。

【図12】第4の実施例の通信プロトコルと通信速度を変更した場合の動作説明図である。

【図13】第5の実施例の自動販売機のブロック図である。

【図14】(a)は第5の実施例のOR接続の回路例を示す図である。(b)はゲートの具体回路例である。

【図15】第6の実施例の自動販売機のブロック図である。

【図16】第6の実施例の制御動作を示すフローチャートである。

【図17】第7の実施例の自動販売機のブロック図である。

【図18】第7の実施例の制御動作を示すフローチャートである。

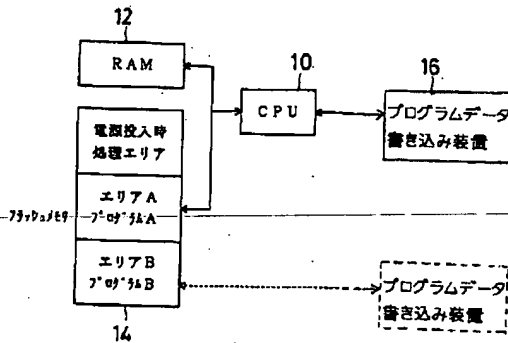
【図19】第8の実施例の自動販売機のブロック図である。

【図20】第8の実施例の説明図である。

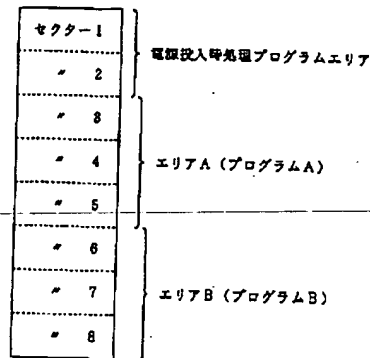
【符号の説明】

- 10 CPU
- 12 RAM
- 14 フラッシュメモリ部
- 16 プログラムデータ書き込み装置
- 20 プログラムデータ入力装置
- 22 ファイル記憶媒体
- 24 ポータブルコンピュータ
- 26 入出力インターフェース
- 28 赤外線変復調ユニット
- 30 データ通信ライン
- 34 ハンディターミナル
- 40 OR回路
- 50 発信番号検出装置
- 52 センター電話番号設定装置
- 58 センターコンピュータ
- 60 電話回線
- 62 メモリマネジメントユニット

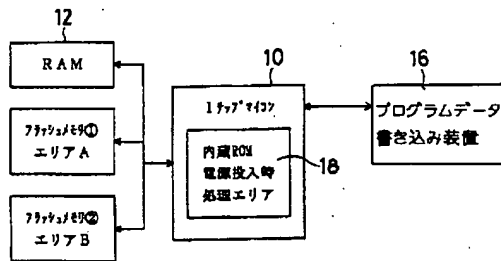
【図1】



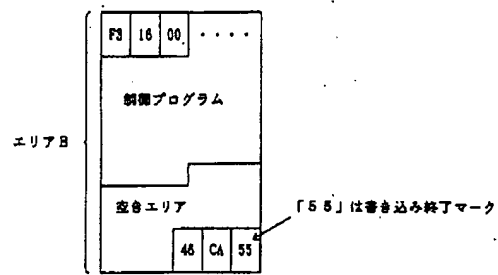
【図2】



【図3】

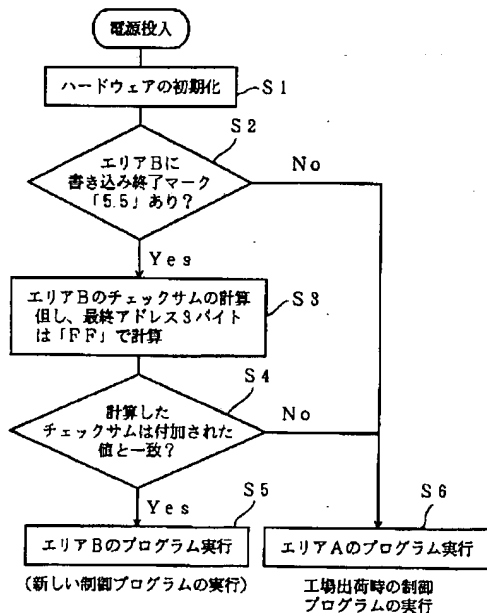


【図4】

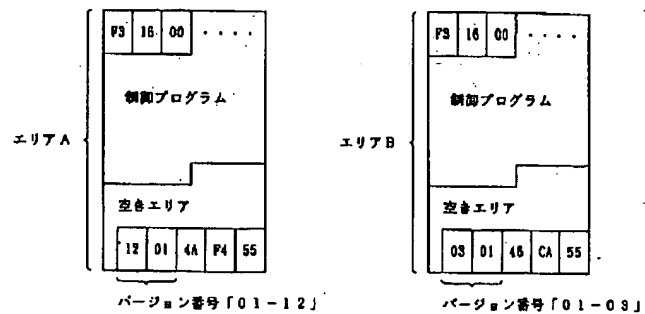


エリアB全体のチェックサム値と書き込み終了マーク  
(但し、計算時はこの3バイトをFFとして計算)

【図5】

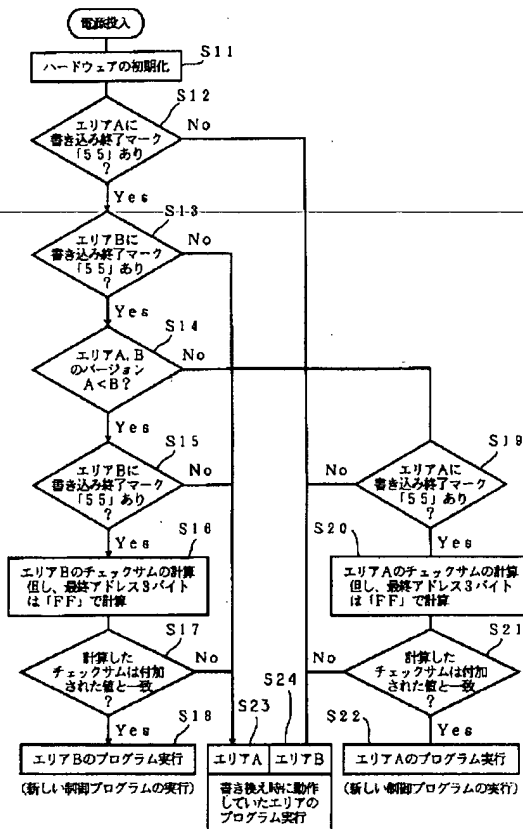


【図6】

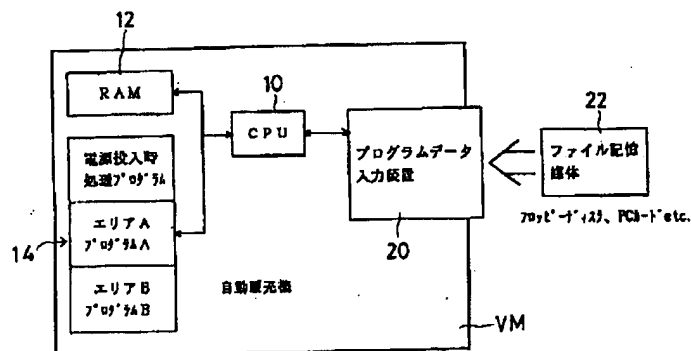




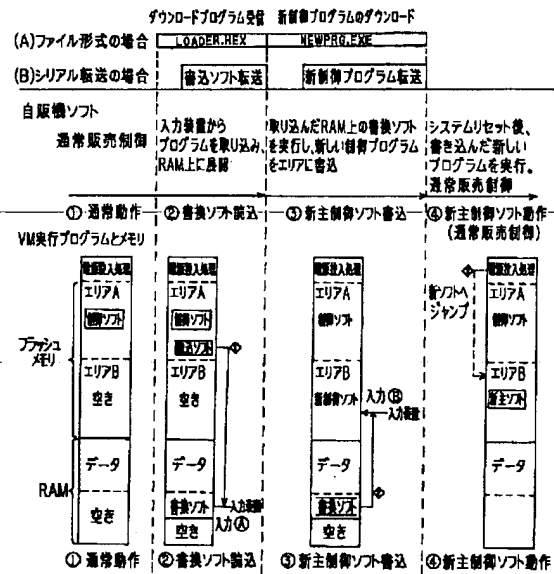
【図7】



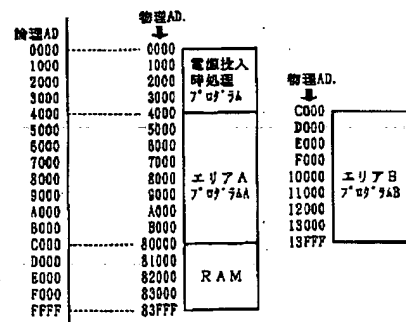
【図8】



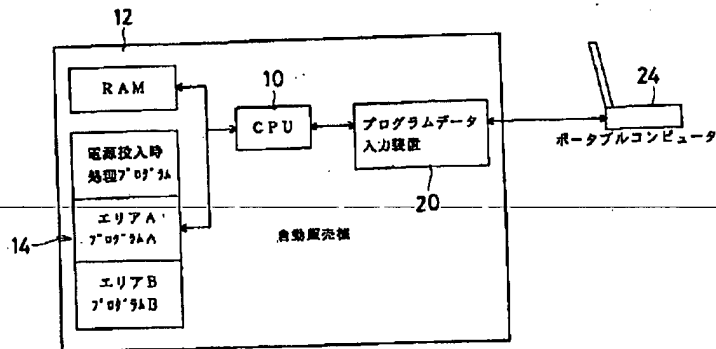
【図10】



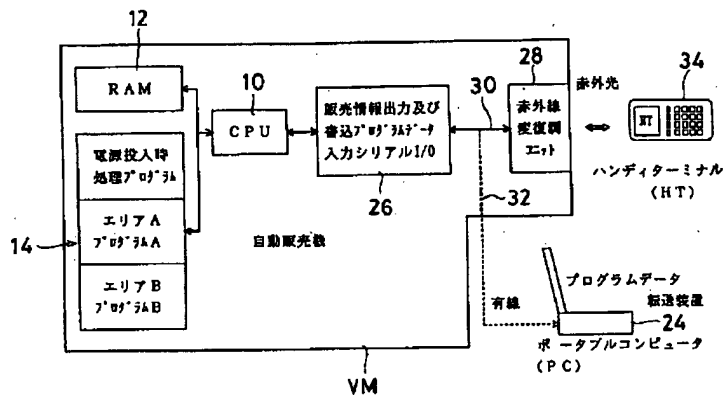
【図20】



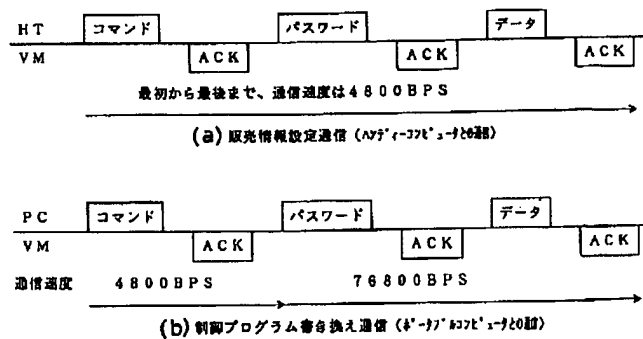
【図9】



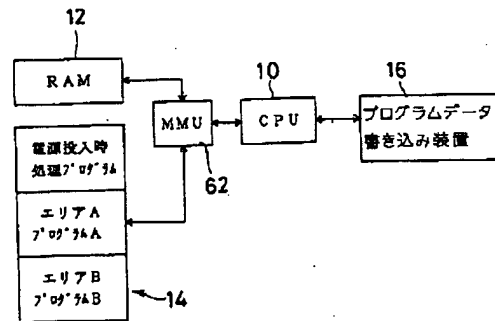
【図11】



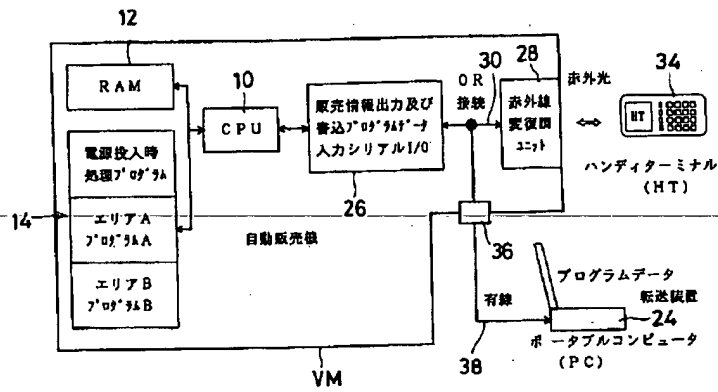
【図12】



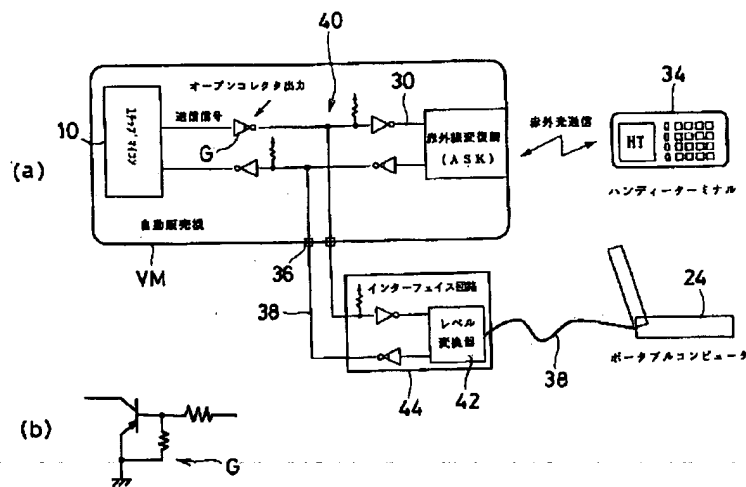
【図19】



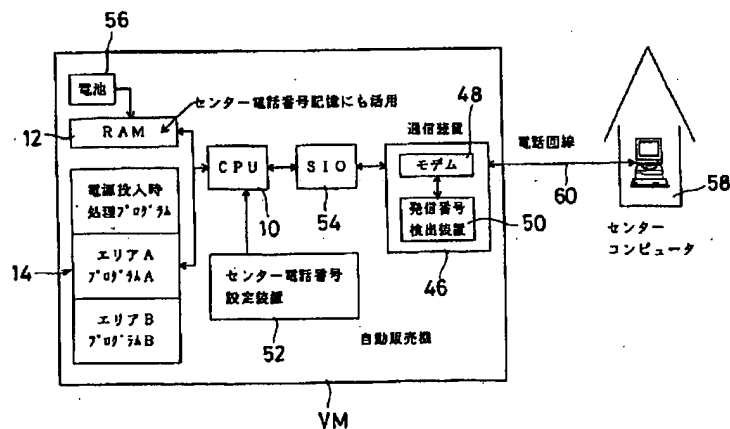
【図13】



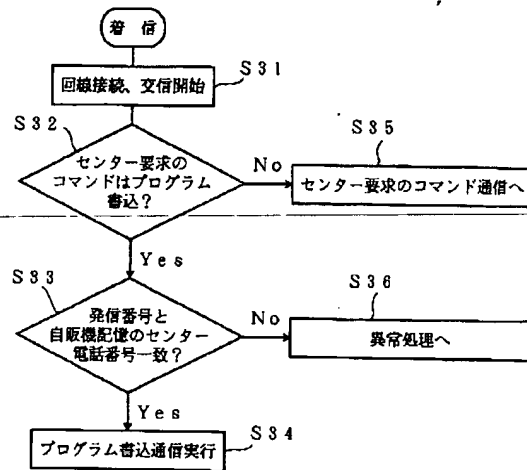
【図14】



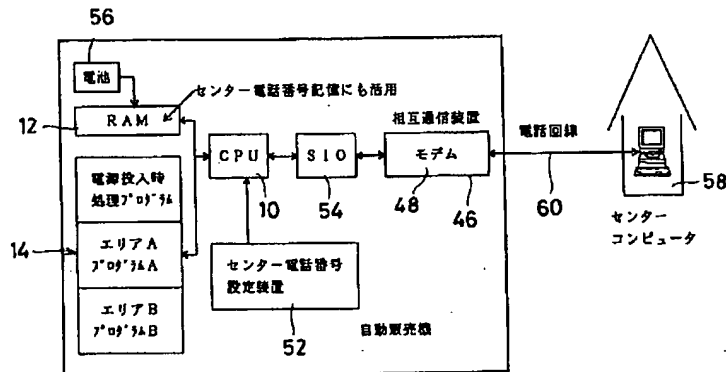
【図15】



【図16】



【図17】



【図18】

